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Energy Research Abstracts

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Office of Scientific and Technical Information
UNITED STATES DEPARTMENT OF ENERGY

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The Office of Scientific and Technical Information (OSTI) in Oak Ridge, Tennessee, provides direction for the Department of Energy's scientific and technical information (STI) program and maintains a centralized base of support to assist Departmental elements in planning, developing, and implementing STI activities. DOE-originated and worldwide literature and software on advances in subjects of interest to DOE researchers are collected, processed, and disseminated using computerized databases, publications, and other media.

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UNITED STATES DEPARTMENT OF ENERGY
Office of Scientific and Technical Information
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Energy Research Abstracts

Coverage

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports and patent applications originated by the U.S. Department of Energy, its laboratories, energy centers, and contractors, as well as theses and conference papers and proceedings issued by these organizations in report form. Audiovisual materials, computer media (magnetic tapes, diskettes, etc.), and engineering drawings are included in this definition. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations, *provided* that the full text of the document has been received by OSTI. Foreign report information is obtained through the International Energy Agency's 18-nation Energy Technology Data Exchange, the International Atomic Energy Agency's International Nuclear Information System, or nation-to-nation agreements. The purpose of this publication is to announce documents produced or obtained by DOE that are not so readily available as journal articles, books, or patents.

Scope

The scope of *ERA* encompasses DOE's research, development, demonstration, and technology programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

The citations presented in *ERA* are available for online searching as records within the Energy Science and Technology Database (EDB). The current-year records are available on the Integrated Technical Information System (ITIS).

Availability

DOE and DOE contractors can obtain *ERA* (regular issues and annual indexes) by using VISA, MasterCard, or OSTI deposit accounts. Contact the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information, call (615)576-8401. *ERA* is also available at authorized GPO Depository Libraries. (List is provided on the inside back cover.)

ERA (regular issues and annual indexes) is available to the public on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Managing Editor, Leota S. Kane
Technical Editor, Barry C. Steele

Information Sources

The citations presented in *Energy Research Abstracts* are a subset of the worldwide energy information provided to the Office of Scientific and Technical Information (OSTI) through exchange agreements with foreign sources and through exchanges or contracts with U.S. organizations.

The **Energy Technology Data Exchange (ETDE)** was established by the International Energy Agency to promote cooperation among members in conducting appropriate energy-related research and development programs through the development of a formal central information sharing system. In accomplishing the objectives of the ETDE, members select, abstract, and index relevant research information published in their countries in accordance with Exchange standards. OSTI serves as the central receiving and processing center for this information, which it then disseminates to national centers in the participating countries. The following countries are currently members of the ETDE:

Australia	Norway
Brazil	Poland
Canada	Republic of Korea
Denmark	Spain
Finland	Sweden
France	Switzerland
Germany	The Netherlands
Italy	United Kingdom
Japan	United States

The **International Nuclear Information System (INIS)** was established to promote the exchange of information on nuclear science and technology. Its operation is similar to that of the ETDE, with the INIS Secretariat being located in Vienna, Austria. Currently, 79 countries and 15 international organizations are members of INIS. OSTI serves as the INIS national center for the United States.

In the exercise of its rights and responsibilities under the agreements to which it is a party, the **Office of Scientific and Technical Information** both receives information from the above sources and submits U.S.-produced information to them. In addition to materials generated by the Department of Energy, this U.S.-produced information is gathered from other government agencies as well as under contract with private information processing companies. All input is computer processed and entered into a database for online retrieval. The database serves as well for the production of numerous OSTI publications.

How To Read A Citation

The principal data elements included in these citations are:

1. **Abstract number** within volume.
2. **Report number** identification for report-type literature.
3. **Title and subtitle** (non-English title may appear in parentheses, if applicable).
4. **Author(s).** First 10 names in the data record are printed, then "et al." is listed.
5. **Author affiliation.** Only first one is listed, in parentheses after author(s) to which it applies.
6. **Collaboration,** if present.
7. **Corporate author(s)** identifying corporation responsible for document.
8. **Date of publication.** If not known, a processing date is in brackets.
9. **Number of pages** or page range. Prices are based on total pages unless special pricing applies.
10. **Language** of document if non-English.
11. **Monograph title** if citation is an analytic (part, chapter, or paper) of a larger monograph.
12. **Sponsoring organization.**
13. **Contract or grant number.**
14. **Secondary identifying number;** may be a conference number.
15. **Conference title, location, and date,** if applicable.
16. **Order number.** The "DE" order number may be used for ordering from NTIS or OSTI, as appropriate. The "TI" prefix is valid only at OSTI.
17. **Sources of availability** from which a copy of the document may be obtained; usually appear as abbreviations. (See information on following page.)
18. **Drop note** or explanatory statement.
19. **Abstract.**
20. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18494 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in 30m^2 air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Order from the Availability Sources

TO OBTAIN A REPORT

Report literature, usually identified by an alphanumeric identifier at the beginning of a citation, is available from the sources listed in the citation (see example of element 2 on page iii). Often the sources are listed as abbreviations. Corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given, **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) OSTI prices are based on total pages unless special pricing applies. The public should order from NTIS or from one of the other agencies listed in the citation. NTIS price codes may continue to appear in some records. To expedite processing, an order form is provided in the back of this publication. NOTE: The order numbers provide quicker access for report ordering. Use the order number where possible.

GPO Superintendent of Documents
Government Printing Office
Washington, DC 20402

GPO Dep. Available for inspection or interlibrary loan at Government Printing Office regional depository libraries.

INIS *Available only in microfiche.*
INIS Clearinghouse
International Atomic Energy Agency
P.O. Box 100, A-1400
Vienna, Austria

NTIS U.S. Department of Commerce
Technology Administration
National Technical Information Service
Springfield, VA 22161

OSTI U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
Fax: (615) 576-2865
e-mail: reports @adonis.osti.gov

ESTSC Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831-1020

CASI Attention: Document Order
NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

How To Use the Indexes

Five indexes are provided for approaching the content of each issue of *Energy Research Abstracts*. Descriptions of entries in these indexes follow.

Corporate Author Index
The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index
Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Subject Index
This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES
See also DEUTERIUM
HYDROGEN 4
TRITIUM
Neutron-Rich Isotopes
Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index
DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 **Wisconsin Univ., Madison (USA). Dept. of Physics**
15:18494 DOE/ER/40438–T1
FG02-88ER60664 **Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)**

Report Number Index
Technical report literature is indexed by the alphanumerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is:

DOE/ER/40438–T1 15:18494 NTIS, OSTI E 1.99: DE89007246 MF-411

Subject Contents

The subject content of *Energy Research Abstracts* is arranged as shown below. The two-digit and four-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level and the 313 second-level categories. Because each issue of *ERA* publishes citations only for those documents announced during the past semimonthly period, some subject categories may not be present in every issue.

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*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope*.

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Energy Research Abstracts

01 COAL, LIGNITE, AND PEAT

0103 Preparation

Refer also to citation(s) 14726, 14749

14706 (DOE/PC/88881–T24) **Engineering development of advanced physical fine coal cleaning technologies - froth flotation. Quarterly technical progress report No. 23, April 1, 1994–June 30, 1994.** ICF Kaiser Engineers, Inc., Pittsburgh, PA (United States). [1995]. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88881. Order Number DE95009345. Source: OSTI; NTIS; GPO Dep.

A study conducted by Pittsburgh Energy Technology Center of sulfur emissions from about 1,300 United States coal-fired utility boilers indicated that half of the emissions were the result of burning coals having greater than 1.2 pounds of SO_2 per million BTU. This was mainly attributed to the high pyritic sulfur content of the boiler fuel. A significant reduction in SO_2 emissions could be accomplished by removing the pyrite from the coals by advanced physical fine coal cleaning. An engineering development project was prepared to build upon the basic research effort conducted under a solicitation for research into Fine Coal Surface Control. The engineering development project is intended to use general plant design knowledge and conceptualize a plant to utilize advanced froth flotation technology to process coal and produce a product having maximum practical pyritic sulfur reduction consistent with maximum practical BTU recovery.

14707 (DOE/PC/89663–T15) **Development of a coal quality expert. Technical progress report No. 17, April 1994–June 1994.** CQ, Inc., Homer City, PA (United States). 5 Oct 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-90PC89663. Order Number DE95009354. Source: OSTI; NTIS; GPO Dep.

The work falls under DOE's Clean Coal Technology Program category of 'Advanced Coal Cleaning.' The 51-month project will provide the utility industry with a PC software program to evaluate the potential for coal cleaning, blending, and switching options to reduce emissions while producing electricity.

14708 (DOE/PC/90311–T3) **Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT. Final report, 14 August 1990–13 August 1994.** Miller, J.D. Utah Univ., Salt Lake City, UT (United States). 18 Oct 1994. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90311. Order Number DE95005661. Source: OSTI; NTIS; GPO Dep.

Air sparged hydrocyclone (ASH) flotation is a new particle separation technology that has been developed at the University of Utah. This technology combines froth flotation principles with the flow characteristics of a hydrocyclone such that the ASH system can perform flotation separations in less than a second. This feature provides the ASH with a high specific capacity, 100 to 600 times greater than the specific capacity of conventional flotation machines. In an effort to develop a more detailed understanding of ASH flotation, multiphase flow characteristics of the air sparged hydrocyclone were studied and the relationship of these characteristics with flotation performance was investigated. This investigation was divided into four phases. In the first phase, the time-averaged multiphase flow characteristics of the ASH during its steady state operation were studied using x-ray computed tomography (x-ray CT). In this regard, a model system, mono-sized quartz flotation with dodecyl amine as collector, using a 2 in. diameter ASH unit (ASH-2C), was selected for study. Various flow regimes, namely, the air core, the froth phase, and the swirl layer, were identified and their spatial extent established for different experimental conditions by x-ray CT analysis. In the second phase, a detailed parametric study of flotation response of the ASH for the same system was carried out in order to establish the effect of various operating variables on flotation response. The findings of this phase of investigation were then correlated with the multiphase flow characteristics as revealed by x-ray CT in the first phase. Thus, the impact of various operating variables on the flow regimes, and hence, on flotation response was established.

14709 (DOE/PC/92206–T8) **Bench-scale testing of the micronized magnetite process. Second quarterly technical progress report, October 1994–December 1994.** AMAX Research and Development, Inc., Golden, CO (United States). 19 Jan 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92206. Order Number DE95009361. Source: OSTI; NTIS; GPO Dep.

This document contains the Quarterly Technical Progress Report for the Micronized Magnetite Testing Project being performed at PETC's Process Research Facility (PRF). This second quarterly report covers the period from October, 1994 through December, 1994. The main accomplishments of Custom Coals and the project subcontractors, during this period, included: (1) Submitted all overdue project documents and kept up with routine reporting requirements; (2) Worked with CLI Corporation, the design subcontractor, and completed the circuit design and finalized all design drawings; (3) Specified and procured all of the process equipment for the circuit, as well as a number of ancillary equipment, instruments, and supplies; (4) Assisted Vangura Iron Inc. in detailing and constructing the structural and platework steel; (5) Subcontracted Rizzo & Sons to perform the circuit mechanical and electrical installation, and prepared for January 23rd installation start date; (6) Organized and prepared for coal and magnetite procurement; (7) Specified and organized an operating personnel plan for the commissioning and testing tasks in the project; (8) Assessed analytical challenges for project, and began to research problem areas. This report contains a short discussion of the project description, objectives, budget, schedule, and teaming arrangement. It also includes a detailed discussion of the abovementioned project accomplishments and plans, organized by the various task series within the project work plan. The final section contains an outline of the specific project goals for the next quarterly reporting period.

14710 (DOE/PC/92208–T9) **Engineering development of advanced physical fine coal cleaning for premium fuel applications. Quarterly technical progress report 9, October 1, 1994–December 31, 1994.** Moro, N. (AMAX Research and Development Center, Golden, CO (United States)); Shields, G.L.; Smit, F.J.; Jha, M.C. USDOE Pittsburgh Energy Technology Center, PA (United States); AMAX Research and Development Center, Golden, CO (United States). 25 Jan 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92208. Order Number DE95009336. Source: OSTI; NTIS; GPO Dep.

The primary goal of this project is the engineering development of two advanced physical fine coal cleaning processes, column flotation and selective agglomeration, for premium fuel applications. The project scope includes laboratory research and bench-scale testing on six coals to optimize these processes, followed by design, and construction of a 2-t/hr process development unit (PDU). The PDU will then be operated to generate 200 ton lots of each of three project coals, by each process. The project began in October, 1992 and is scheduled for completion by March, 1997. During Quarter 9 (October–December, 1995), parametric and optimization testing was completed for the Taggart, Sunnyside, and Indiana VII coal using a 12-inch Microcel™ flotation column. The detailed design of the 2-t/hr PDU grinding, flotation, and dewatering circuits neared completion with the specification of the major pieces of capital equipment to be purchased for these areas. Selective agglomeration test work investigated the properties of various industrial grades of heptane for use during bench- and PDU-scale testing. It was decided to use a hydrotreated grade of commercial

heptane due to its low cost and low concentration of aromatic compounds. The final Subtask 6.4 CWF Formulation Studies Test Plan was issued. A draft version of the Subtask 6.5 Preliminary Design and Test Plan Report was also issued, discussing the progress made in the design of the bench-scale selective agglomeration unit. PDU construction work moved forward through the issuing of 26 request for quotations and 21 award packages for capital equipment.

14711 (DOE/PC/92550–9) **Evaluation of hyperbaric filtration for fine coal dewatering. Ninth quarterly technical progress report, October 1–December 31, 1994.** Parekh, B.K. (Univ. of Kentucky, Lexington, KY (United States)); Leonard, J.W.; Hogg, R.; Fonesca, A. Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research. [1995]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92550. Order Number DE95009630. Source: OSTI; NTIS; GPO Dep.

The main objectives of the project are to investigate the fundamental aspects of particle-liquid interaction in fine coal dewatering, to conduct laboratory and pilot plant studies on the applicability of hyperbaric filter systems and to develop process conditions for dewatering of fine clean coal to less than 20% moisture. The program consists of three phases, namely: model development; laboratory studies; and field testing. The Pennsylvania State University is leading efforts in Phase 1, the University of Kentucky in Phase 2, and Consol Inc. in Phase 3 of the program. The Pennsylvania State University is developing a theoretical model for hyperbaric filtration systems, whereas the University of Kentucky is conducting experimental studies to investigate fundamental aspects of particle-liquid interaction and application of high pressure filter in fine coal dewatering. The optimum filtration conditions identified in Phase 1 and 2 will be tested in a Consol Inc. coal preparation plant using an Andritz Ruthner portable hyperbaric filtration unit. Results to date from all three phases are discussed.

14712 (DOE/PC/94116–T3) **Emissions reductions in coal-fired home heating stoves through use of briquettes. Quarterly report, October 1, 1994–December 31, 1994.** Acurex Environmental Corp., Research Triangle Park, NC (United States). 25 Jan 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94PC94116. Order Number DE95010627. Source: OSTI; NTIS; GPO Dep.

This quarter has seen additional experimentation in the briquette formulation. Several combustion tests have been performed. Many of the results are presented here, though the organics analysis is still in progress. A revised Environmental Questionnaire was submitted during this period. A revised contract was signed between the U.S. Department of Energy (DOE) and Acurex Environmental Corporation on November 18, 1994. With this event, business development tasks were restarted. At the conclusion of this period, the authors submitted a briquette formulation and process diagram to Euromining Consulting that will be used for the preparation of 2,500 tons of briquettes for with-product market testing, and combustion tests at the INCO Veritas (INCO) and Przedsiebiorstwo Energetyki Cieplnej (PEC) boiler houses.

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Refer also to citation(s) 14746, 14753, 14754, 15264, 15268, 15269, 15270, 15271, 15272, 15273, 15275, 15368

14713 (BNL–60543) **Application of biochemical interactions in fossil fuels.** Lin, M.S.; Premuzic, E.T. Brookhaven National Lab., Upton, NY (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9407176–1: Minerals bioprocessing 2 conference, Snowbird, UT (United States), 10-15 Jul 1994). Order Number DE95009653. Source: OSTI; NTIS; GPO Dep.

Certain extreme environments tolerant microorganisms interact with heavy crude oils by means of multiple biochemical reactions, asphaltenes, and bituminous materials. These reactions proceed via pathways which involve characteristic components of oils and coals such as asphaltenes, and in the chemically related constituents found in bituminous coals. These chemical components serve as markers of the interactions between microorganisms and fossil fuels. Studies in which temperature, pressure, and salinity tolerant microorganisms have been allowed to interact with different crude oils and bituminous coals, have shown that biochemically induced changes occur in the distribution of hydrocarbons and in the chemical nature of organometallic and heterocyclic compounds. Such structural chemical rearrangements have direct applications in monitoring the efficiency, the extent, and the chemical nature of the fossil fuels bioconversion. Recent developments of chemical marker applications in the monitoring of fossil fuels bioconversion will be discussed.

14714 (CONF-940813–40) **Technology development for cobalt F-T catalysts. Topical report No.1, Effects of supports and promoters on cobalt F-T catalyst behavior in fixed bed vs. slurry bubble column reactors.** Oukaci, R. (Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering); Marcelin, G.; Goodwin, J.G. Jr. Energy International Corp., Pittsburgh, PA (United States); Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. 17 Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92108. From 208. American Chemical Society national meeting; Washington, DC (United States); 21-26 Aug 1994. Order Number DE95009368. Source: OSTI; NTIS; GPO Dep.

A series of cobalt-based F-T catalysts supported on alumina, silica, or titania were prepared with Ru and/or ZrO_2 as promoters. All catalysts were extensively characterized by different methods. The catalysts were evaluated in terms of their activity and selectivity both in fixed bed and slurry bubble column reactors. Similar trends were observed in both reactors for support effects. However, this was not the case for the effects of promoters. Noble metal promotion effects were much more accentuated in the fixed bed reactor than under slurry bubble column reaction conditions, while the opposite seemed to hold true in the case of ZrO_2 promotion effects, at least for SiO_2-supported Co catalysts.

14715 (CONF-940930–8) **Technology development for cobalt F-T catalysts. Topical report No.2, Comparison of patented F-T cobalt catalysts.** Oukaci, R. (Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering); Marcelin, G.; Goodwin, J.G. Jr. Energy International Corp., Pittsburgh, PA (United States); Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. 17 Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92108. From 11. annual international Pittsburgh coal conference: coal, energy and the environment; Pittsburgh, PA (United States); 12-16 Sep 1994. Order Number DE95009369. Source: OSTI; NTIS; GPO Dep.

Based on the information provided in patents assigned to Gulf, Shell, Exxon, and Statoil, a series of catalysts has been prepared consisting of 12–20 wt. % cobalt, a second metal promoter (Ru or Re), and an oxide promoter such as lanthana, zirconia, or alkali oxide, the support being alumina, silica, or titania. All catalysts have been extensively characterized by different methods. The catalysts have been evaluated in terms of their activity, selectivity both in a fixed bed reactor and in a slurry bubble column reactor, and the results correlated with their physico-chemical properties.

14716 (CONF-950402–6) **Technology development for cobalt F-T catalysts. Topical report No.3, Zirconia promotion of Fischer-Tropsch cobalt catalysts: Behavior in fixed-bed and slurry bubble column reactors.** Oukaci, R. (Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering); Marcelin, G.; Goodwin, J.G. Jr. Energy International Corp., Pittsburgh, PA (United States); Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. 17 Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92108. From 209. American Chemical Society (ACS) national meeting; Anaheim, CA (United States); 2-6 Apr 1995. Order Number DE95009370. Source: OSTI; NTIS; GPO Dep.

A series of cobalt-based F-T catalysts supported on alumina and silica were prepared with different loadings of Zr and different sequences of impregnation of Co and Zr. All catalysts were extensively characterized by different methods. The catalysts were evaluated in terms of their activity and selectivity both in fixed bed and slurry bubble column reactors. Addition of ZrO_2 to both Co/SiO_2 and Co/Al_2O_3 catalysts resulted in at least a twofold increase in the catalyst activity for F-T synthesis in the fixed bed reactor. In

the slurry bubble column reactor, a similar promotion effect was observed for the SiO_2-supported catalysts, while the addition of Zr to a cobalt/alumina catalyst had a less significant effect.

14717 (DOE/MC/24116–4035) **Development of an advanced, continuous mild gasification process for the production of co-products. Quarterly report, October 1–December 31, 1994.** O'Neal, G.W. Coal Technology Corp., Bristol, VA (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC24116. Order Number DE95010529. Source: OSTI; NTIS; GPO Dep.

The primary objective of this project is to develop an advanced continuous mild gasification process and product upgrading processes which will be capable of eventual commercialization. The program consists of four tasks. Task 1 is a literature survey of mild gasification processes and product upgrading methods and also a market assessment of markets for mild gasification products. Based on the literature survey, a mild gasification process and char upgrading method will be identified for further development. Task 2 is a bench-scale investigation of mild gasification to generate design data for a larger scale reactor. Task 3 is a bench-scale study of char upgrading to value added products. Task 4 is being implemented by building and operating a 1000-pound per hour demonstration facility. Task 4 also includes a technical and economic evaluation based on the performance of the mild gasification demonstration facility. The continuous coke pilot plant installation was completed in the fourth quarter of 1994. Start-up showed areas needing improvement. Initial formed coke production has used five formulations. In-house testing eliminated two with the remaining three formulations being used as guidelines for production of formed coke for use tests. Multiple tons runs will be made for these tests.

14718 (DOE/MC/25140–4009) **Hot Gas Cleanup Test Facility for gasification and pressurized combustion. Quarterly report, October–December 1994.** Southern Co. Services, Inc., Birmingham, AL (United States). Feb 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC25140. Order Number DE95000081. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to evaluate hot gas particle control technologies using coal-derived gas streams. This will entail the design, construction, installation, and use of a flexible test facility which can operate under realistic gasification and combustion conditions. The major particulate control device issues to be addressed include the integration of the particulate control devices into coal utilization systems, on-line cleaning techniques, chemical and thermal degradation of components, fatigue or structural failures, blinding, collection efficiency as a function of particle size, and scale-up of particulate control systems to commercial size. The conceptual design of the facility was extended to include a within scope, phased expansion of the existing Hot Gas Cleanup Test Facility Cooperative Agreement to also address systems integration issues of hot particulate removal in advanced coal-based power generation systems. This expansion included the consideration of the following modules at the test facility in addition to the original Transport Reactor gas source and Hot Gas Cleanup Units: carbonizer/pressurized circulating fluidized bed gas source; hot gas cleanup units to mate to all gas streams; combustion gas turbine; and fuel cell and associated gas treatment. The major emphasis during this reporting period was continuing the detailed design of the facility and integrating the particulate control devices (PCDs) into structural and process designs. Substantial progress in underground construction activities was achieved during the quarter. Delivery and construction of coal handling and process structural steel began during the quarter. Delivery and construction of coal handling and process structural steel began during the quarter. MWK equipment at the grade level and the first tier are being set in the structure.

14719 (DOE/MC/25177–3935) **Assessment and evaluation of ceramic filter cleaning techniques: Task Order 19.** Chen, H.; Zaharchuk, R.; Harbaugh, L.B.; Klett, M. Gilbert/Commonwealth, Inc., Reading, PA (United States). Oct 1994. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC25177. Order Number DE95000028. Source: OSTI; NTIS; GPO Dep.

The objective of this study was to assess and evaluate the effectiveness, appropriateness and economics of ceramic barrier filter cleaning techniques used for high-temperature and high-pressure particulate filtration. Three potential filter cleaning techniques were evaluated. These techniques include, conventional on-line pulse driven reverse gas filter cleaning, off-line reverse gas filter cleaning and a novel rapid pulse driven filter cleaning. These three ceramic filter cleaning techniques are either presently employed, or being considered for use, in the filtration of coal derived gas streams (combustion or gasification) under high-temperature high-pressure conditions. This study was divided into six subtasks: first principle analysis of ceramic barrier filter cleaning mechanisms; operational values for parameters identified with the filter cleaning mechanisms; evaluation and identification of potential ceramic filter cleaning techniques; development of conceptual designs for ceramic barrier filter systems and ceramic barrier filter cleaning systems for two DOE specified power plants; evaluation of ceramic barrier filter system cleaning techniques; and final report and presentation. Within individual sections of this report critical design and operational issues were evaluated and key findings were identified.

14720 (DOE/MC/26366–4006) **A calcium oxide sorbent process for bulk separation of carbon dioxide. Final report.** Han, C.; Silaban, A.; Narcida, M.; Harrison, D.P. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering. Dec 1994. 276p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26366. Order Number DE95011399. Source: OSTI; NTIS; GPO Dep.

The expected commercialization of coal gasification technology in the US and world-wide will create a need for advanced gas purification and separation processes capable of operating at higher temperatures and in more hostile environments than is common today. For example, a high-temperature, high-pressure process capable of separating CO_2 from coal-derived gas may find application in purifying synthesis gas for H_2, NH_3, or CH_3OH production. High temperature CO_2 removal has the potential for significantly improving the operating efficiency of integrated gasification-molten carbonate fuel cells for electric power generation. This study proved the technical feasibility of a CO_2-separation process based upon the regenerable noncatalytic gas-solid reaction between CaO and CO_2 to form $CaCO_3$. Such a process operating at 650°C and 15 atm with 15% CO_2, in the feed gas has the potential for removing in excess of 99% of the CO_2 fed. Selection of a sorbent precursor which, upon calcination, produces high-porosity CaO is important for achieving rapid and complete reaction. The addition of magnesium to the sorbent appears to improve the multicycle durability at a cost of reduced CO_2 capacity per unit mass of sorbent. When CO and H_2O were present in the feed gas, the water gas shift and carbonation reactions occurred simultaneously, thus providing a potential alternate route for the production of H_2 from coal-derived gas. Material and energy balances based on an Aspen simulation were conducted by METC personnel. This phase of the study identified process related problems which must be addressed before the combined shift-carbonation process could become commercial. Other applications of the combined shift-carbonation process, in addition to the production of high purity H_2, have been suggested.

14721 (DOE/MC/27226–4039) **Development of biological coal gasification (MicGAS process). 18th Quarterly report.** ARCTECH, Inc., Chantilly, VA (United States). 24 Jan 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27226. Order Number DE95010525. Source: OSTI; NTIS; GPO Dep.

The paper reports the progress on the various tasks and subtasks associated with this project. Task 2, Enhance methane production, is complete. Experimental data are presented for its last subtask, Low cost nutrient amendment. Task 3, Effect of substrate on the microbes, has also been completed. Data and discussions are presented for the following subtasks: Effect of coal concentration; microbial resistance to inhibitors; and Detection of sulfur contaminant. Task 4, in progress, is Biomethanation of TxL in bioreactors. The paper discusses the investigation of more efficient bioconversion of low rank coals into methane using two stage bioreactors.

14722 (DOE/MC/29246–3981) **Hot coal gas desulfurization with manganese based sorbents. Quarterly report, June–September 1994.** Hepworth, M.T.; Slimane, R.B. Minnesota Univ., Minneapolis, MN (United States). Nov 1994. 24p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract AC21-92MC29246. Grant USDI-BM/C0299002-Mod.3. Order Number DE95000061. Source: OSTI; NTIS; GPO Dep.

The focus of work being performed on hot coal gas desulfurization at the Morgantown Energy Technology Center is primarily in the use of zinc titanate sorbents; however, prior studies indicated that an alternate sorbent, manganese dioxide-containing ore in mixture with alumina (75 wt% ore + 25 wt% Al_2O_3) appears to be a strong contender to zinc-based sorbents. Manganese, for example, has a lower vapor pressure in the elemental state than zinc; hence, it is not as likely to undergo zinc-depletion from the sorbent surface upon loading and regeneration cycles. Also manganese oxide is less readily reduced to the elemental state than iron; hence, the range of reduction potentials for oxygen is somewhat greater than for zinc ferrite. In addition, thermodynamic analysis of the manganese-oxygen-sulfur system shows it to be less amenable to sulfation than zinc ferrite. Also manganese chlorides are much less stable and volatile than zinc chlorides. Potential also exists for utilization of manganese at higher temperatures than zinc ferrite or zinc titanate. This Eighth Quarterly Report documents progress in pelletizing and testing via thermo-gravimetric analysis of individual pellet formulations of manganese ore/alumina combinations and also manganese carbonate/alumina with two binders, dextrin and bentonite.

14723 (DOE/MC/29261–4020) **Trace element emissions. Semi-annual report, October 1994–February 1995.** Pigeaud, A.; Maru, H.; Wilemski, G.; Helble, J. Energy Research Corp., Danbury, CT (United States). Feb 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29261. Order Number DE95000090. Source: OSTI; NTIS; GPO Dep.

Many trace elements can exist in raw coal gas either in the form of metallic vapors or gaseous compounds which, besides their action on potentially "very clean" advanced power generating systems such as fuel cells and gas turbines, can also be detrimental to plant and animal life when released into the atmosphere. Therefore, volatile trace contaminants from coal which can also be toxic must be removed before they become detrimental to both power plant performance/endurance and the environment. Five trace elements were selected in this project based on: abundance in solid coal, volatility during gasification, effects on downstream systems and toxicity to plant and animal life. An understanding was sought in this investigation of the interactions of these five trace elements (and their high temperature species) with the different components in integrated cleanup and power generating systems, as well as the ultimate effects with respect to atmospheric emissions. Utilizing thermodynamic calculations and various experimental techniques, it was determined that a number of trace contaminants that exist in coal may be substantially removed by flyash, and after that by different sorbent systems. High temperature cleanup of contaminants by sorbents such as zinc titanate, primarily to remove sulfur, can also absorb some metallic contaminants such as cadmium and antimony. Further polishing will be required, however, to eliminate trace contaminant species incorporating the elements arsenic, selemium, lead, and mercury.

14724 (DOE/MC/30012–4021) **Advanced sulfur control concepts for hot gas desulfurization technology. Quarterly report, October–December 1994.** Harrison, D.P. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering. Jan 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-94MC30012. Order Number DE95000091. Source: OSTI; NTIS; GPO Dep.

The goal is the development of simpler and economically superior processing of regenerable sorbents used for control of hydrogen sulfide in hot, high-pressure gas streams in advanced power generating systems. The improved processing will produce an elemental sulfur byproduct. Progress during the past quarter was limited by delays in identifying an appropriate analytical instrument for measuring the concentration of sulfur species ($S_x(g)$, H_2S, and SO_2 in the regeneration product gas. The ability to carry out this analysis on a real-time basis is an important component of the overall project and we feel that a satisfactory gas analysis procedure should be available before forging ahead with other experimental activities. The primary accomplishment, therefore, was the completion and submission of the Task 3 Project Plan. This plan, which assumed a satisfactory solution to sulfur analysis problem, is included in this quarterly report.

14725 (DOE/METC/C–95/7184) **Hot gas particulate cleanup for advanced coal-based power systems.** Dennis, R.A.; McDaniel, H.M.; McMahon, T.J. USDOE Morgantown Energy Technology Center, WV (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). (CONF-950629–4: ASME international gas turbine and aeroengine congress and exposition: land, sea and air, Houston, TX (United States), 5-8 Jun 1995). Order Number DE95010307. Source: OSTI; NTIS; GPO Dep.

Integrated Gasification Combined Cycle and Pressurized Fluidized-Bed Combustion power systems have made it possible to use coal while still protecting the environment. Such power systems virtually eliminate the pollutants associated with coal-fired plants built before the 1970's. Superior environmental performance and high system efficiency requires that gas stream cleanup be conducted under high temperature and high pressure process conditions. To realize this high system efficiency, particulate cleanup levels must meet gas turbine particulate tolerance limits. Discussed below are some of the particulate cleanup requirements and challenges for these advanced power systems. Also presented is the work underway to support particulate cleanup technology and the Clean Coal Technology (CCT) Program through pilot-scale testing and filter component development.

14726 (DOE/PC/88881–T25) **Engineering development of advanced physical fine coal cleaning technologies - froth flotation. Quarterly technical progress report No. 24, July 1, 1994–September 30, 1994.** ICF Kaiser Engineers, Inc., Pittsburgh, PA (United States). [1995]. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88881. Order Number DE95009346. Source: OSTI; NTIS; GPO Dep.

A study conducted by Pittsburgh Energy Technology Center of sulfur emissions from about 1,300 United States coal-fired utility boilers indicated that half of the emissions were the result of burning coals having greater than 1.2 pounds of SO_2 per million BTU. This was mainly attributed to the high pyritic sulfur content of the boiler fuel. A significant reduction in SO_2 emissions could be accomplished by removing the pyrite from the coals by advanced physical fine coal cleaning. An engineering development project was prepared to build upon the basic research effort conducted under a solicitation for research into Fine Coal Surface Control. The engineering development project is intended to use general plant design knowledge and conceptualize a plant to utilize advanced froth flotation technology to process coal and produce a product having maximum practical pyritic sulfur reduction consistent with maximum practical BTU recovery.

14727 (DOE/PC/90296–T10) **Structure and thermochemical kinetic studies of coal pyrolysis. Final technical report.** Dodoo, J.N.D.; Hetzberg, M. Maryland Univ., Princess Anne, MD (United States). Dept. of Natural Sciences. [1994]. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90296. Order Number DE95006351. Source: OSTI; NTIS; GPO Dep.

The structure and kinetics of low rank coals, namely, Montana Rosebud subbituminous and Beulah lignite coals have been studied. CO_2 laser heating of separated arrays of particles at high flux levels has made possible the investigation of the pyrolysis and char oxidation processes of lignite and subbituminous coal particles as a function of exposure time at laser fluxes of 200–300 w/cm^2. The Beulah lignite and Rosebud subbituminous coals studied were supplied by the Penn State Coal Sample Bank. They had been collected, ground, and packaged in an inert atmosphere. The coal samples were subsequently stored, sieved, carefully dried, and maintained in a glove box under dry nitrogen. The moisture loss of the as-received samples was within experimental error of the supplied ASTM analysis. The mass loss vs time reported here are for

particles that were dried at 120°C under nitrogen. The morphological changes in the particles with laser exposure was monitored by scanning electron microscopy. Correlation of weight loss data with microscopic observation has been made for the devolatilization in air atmosphere. Care was taken to insure that mass loss did not reflect loss of particles. Pyrolysis rates were determined for particles in air and in a nitrogen flow, and compared with the results of corresponding laser pyrolysis studies of high and low-volatile bituminous coal particle arrays. Elemental analysis of the char particles were also carried out. The studies were extended to a typical run-of-the mill coal samples collected from a power generating company.

14728 (DOE/PC/91040–48) **Advanced direct liquefaction concepts for PETC generic units. Quarterly technical progress report, July–September 1994.** Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research; Sandia National Labs., Albuquerque, NM (United States); CONSOL, Inc., Pittsburgh, PA (United States); LDP Associates (United States). Nov 1994. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91040. Order Number DE95010505. Source: OSTI; NTIS; GPO Dep.

The aims of this research program are to advance to bench-scale testing, concepts that have the potential for making net reductions in direct coal liquefaction process costs. The research involves a teaming arrangement between the University of Kentucky Center for Applied Energy Research (CAER), Consolidation Coal Company (CONSOL), Sandia National Laboratories (SNL), and LDP Associates. In general, the process concepts involve "pretreatment", that is, chemical and physical modifications to the feed materials to the liquefaction process, prior to their introduction into the liquefaction reactors. CAER and SNL will evaluate chemical approaches to allow better control of the initial conversion reactions through (1) the use of CO pretreatment to stabilize the coal, reject oxygen (thereby lowering hydrogen consumption), and inhibit the propensity for regressive reactions (CAER); (2) the introduction of promoted dispersed iron-based catalysts (CAER); and (3) the production of active H-donor distillate solvent fractions (SNL), using dewaxed distillate (CONSOL) and fluid coker overhead (CAER–CONSOL) as feedstocks. CONSOL will study oil agglomeration for the rejection of coal ash, ash in the recycled resid, and, potentially, catalyst recovery. The success of the research in developing an integrated process concept will be gauged in part by the results of an economic evaluation (LDP Associates). Emphasis will be given to low-rank coals. Accomplishments for this quarter are described.

14729 (DOE/PC/91051–T8-Vol.2) **Advanced liquefaction using coal swelling and catalyst dispersion techniques. Volume 2, appendices. Final technical report, October 1, 1991–September 30, 1994.** Curtis, C.W. (Auburn Univ., AL (United States)); Chander, S.; Gutterman, C. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1995]. 396p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91051. Order Number DE95009648. Source: OSTI; NTIS; GPO Dep.

Liquefaction experiments were undertaken using subbituminous Black Thunder mine coal to observe the effects of aqueous SO_2 coal beneficiation and the introduction of various coal swelling solvents and catalyst precursors. Aqueous SO_2 beneficiation of Black Thunder coal removed alkali metals and alkaline earth metals, increased the sulfur content and increased the catalytic liquefaction conversion to THF solubles compared to untreated Black Thunder coal. The liquefaction solvent had varying effects on coal conversion, depending upon the type of solvent added. The hydrogen donor solvent, dihydroanthracene, was most effective, while a coal-derived Wilsonville solvent promoted more coal conversion than did relatively inert 1-methylnaphthalene. Swelling of coal with hydrogen bonding solvents tetrahydrofuran (THF), isopropanol, and methanol, prior to reaction resulted in increased noncatalytic conversion of both untreated and SO_2 treated Black Thunder coals, while dimethylsulfoxide (DMSO), which was absorbed more into the coal than any other swelling solvent, was detrimental to coal conversion. Swelling of SO_2 treated coal before liquefaction resulted in the highest coal conversions; however, the untreated coal showed the most improvements in catalytic reactions when swelled in either THF, isopropanol, or methanol prior to liquefaction. The aprotic solvent DMSO was detrimental to coal conversion.

14730 (DOE/PC/91055–T10) **Role of the resid solvent in catalytic coprocessing. Quarterly report, October 1994–December 1994.** Curtis, C.W. Auburn Univ., AL (United States). [1995]. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91055. Order Number DE95010395. Source: OSTI; NTIS; GPO Dep.

This quarterly report summarizes the authors' work in characterizing resid solvents in the coal liquefaction process. The research performed this quarter involved a literature review in which the literature involving naphthenic structures was reviewed to ascertain if any new literature was available that could provide insights into this work. The literature review is given in part one of this report. The second aspect of the work was the performance of additional model compound studies to complete the work that has been previously performed. The third part of this report was the work performed in preparation for the Department of Energy review to be held on January 24, 1995, in Pittsburgh, PA. The written documentation was due to the Department of Energy in December and is attached as Part 3 of this report.

14731 (DOE/PC/91281–T13) **Low severity coal liquefaction promoted by cyclic olefins. Quarterly report, October 1994–December 1994.** Curtis, C.W. Auburn Univ., AL (United States). [1995]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91281. Order Number DE95010628. Source: OSTI; NTIS; GPO Dep.

The research performed during the October to December 1994 quarter centered on two areas. The first area involved the writing of a paper based on research performed on this project concerning the mild acidic pretreatment of low rank coals and their liquefaction behavior in the presence of hydrogen donors with different reactivities. The second area that was worked on during the quarter was the high temperature infrared analysis of cyclic olefins. The work is ongoing and is currently involving a considerable amount of equipment and technique development. Cyclic olefins, such as 1,4,5,8-tetrahydronaphthalene (isotetralin) and 1,4,5,8,9,10-hexahydroanthracene (HHA), are highly reactive hydrogen donor compounds that readily donate their hydrogen to coal and model acceptors when heated. Numerous reactions have been performed using these cyclic olefins with high rank and low rank coals as well as with model acceptors. In each case the cyclic olefins have proven themselves to be active donors. Further evaluation of the reactivity of these donors with pretreated low rank coals and at different temperatures is described more fully in this report.

14732 (DOE/PC/91287–16) **Supercritical thermodynamics of sulfur and nitrogen species. Final technical report, October 1, 1991–September 30, 1994.** Eckert, C.A. Georgia Inst. of Tech., Atlanta, GA (United States). School of Chemical Engineering. [1994]. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91287. Order Number DE95007893. Source: OSTI; NTIS; GPO Dep.

Significant opportunity exists for the application of supercritical fluid (SCF) technology to coal processing, both for pretreatment of high sulfur coals, as well as liquefaction and treatment of coal liquids. Supercritical fluids are attractive solvents for a variety of coal processing applications because of their unusual solvating and mass transfer properties. Solubility studies have been carried out for a number of model coal and coal-liquid compounds, primarily in pure supercritical fluids. We have extended this database of model coal compound equilibria using modern techniques that have the advantage of being much more rapid than traditional techniques. Cosolvent effects on solubility have also been investigated over a variety of solvent properties. In addition, specific molecular interactions have been investigated through spectroscopic techniques. The resulting data has been used to develop a physical-chemical equation of state (EOS) model of SCF solutions with meaningful parameters. This equation of state model has been used to predict solubility behavior, which will permit the design and tailoring of SCF cosolvent systems for specific coal processing applications.

14733 (DOE/PC/91291–T14) **Mechanism of hydrogen incorporation in coal liquefaction. Fourteenth progress report,**

October 1994–December 1994. Kentucky Univ., Lexington, KY (United States). Research Foundation. [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91291. Order Number DE95010647. Source: OSTI; NTIS; GPO Dep.

The authors continued work on the reaction of D_2 with organic compounds. The focus of this work is to reveal the mechanism of hydrogen reaction during coal liquefaction.

14734 (DOE/PC/92120–T7) **Advanced coal liquefaction. Final quarterly report, July 1, 1994–September 31, 1994.** Media and Process Technology, Inc., Pittsburgh, PA (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92120. Order Number DE95009367. Source: OSTI; NTIS; GPO Dep.

In this quarter, the authors investigated means to overcome the membrane fouling in the presence of tetraline at 150°C. Previously, it was indicated that tetraline underwent degradation at this temperature. Further, it was identified that this reaction could be minimized if one purged tetraline with nitrogen. It was hypothesized that tetraline could be stable at 150°C in the absence of oxygen. In this quarter, the authors attempted to apply the similar concept in the membrane filtration system. The entire filtration was thoroughly purged with nitrogen before introducing tetraline. Also during filtration, the collection bottle was purged with nitrogen. The permeate stream was maintained vacuum. Under this condition, the tetraline collected from reject and permeate did not show any chemical degradation. It is believed that the porous surface of Al_2O_3/SiO_2 membranes may act as a catalyst for the degradation of tetraline. The degradation products, likely polymeric, fouled the membrane. The above tests were repeated and a similar fouling phenomenon was observed.

14735 (DOE/PC/92122–T8) **Novel bimetallic dispersed catalysts for temperature-programmed coal liquefaction. Technical progress report, July–September 1994.** Schmidt, E.; Kirby, S.; Song, Chunshan; Schobert, H.H. Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering. Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92122. Order Number DE95010616. Source: OSTI; NTIS; GPO Dep.

Coal liquefaction involves cleavage of methylene and dimethylene bridges connecting polycyclic aromatic units and the reactions of various oxygen functional groups. The selected compound for model coal liquefaction reactions are 4-(l-naphthylmethyl)bibenzyl (NMBB) and anthrone. This report describes (1) the synthesis and screening of selected iron carbonyl complexes as precursors of dispersed catalysts for hydrocracking of NMBB, and (2) the hydrogenation and hydrodeoxygenation reactions of anthrone. Experiments were carried out at 400°C (for NMBB) or at both 300°C and 400°C (for anthrone) for 30 min under 6.9 MPa H_2 pressure. All catalyst precursors converted NMBB predominately into naphthalene and 4-methylbibenzyl. Small amounts of secondary products were formed by hydrogenation, isomerization and fragmentation of the primary products. The greatest activity among the tested catalysts was found using iron pentacarbonyl with added sulfur. Increasing cluster size lead to decreased activity. The beneficial effect of sulfur was also demonstrated in a reaction of iron pentacarbonyl and NMBB. A sulfur-free run showed substantially smaller conversion, whereas an experiment with added sulfur gave considerably higher conversion. Again, the same trend between cluster size and catalyst activity was observed. The objective of examining oxygen-containing compounds is to investigate the possibility of reduced oxygen functionality in the products of a reaction performed under liquefaction conditions, with the use of highly dispersed catalysts from monometallic and bimetallic organometallic precursors. Both the Ni-Mo and CoMo-T2 precursors showed an increase in the yield of non-0-containing products, compared to a non-catalytic reaction or one using a standard inorganic catalyst precursor, ammonium tetrathiomolybdate (ATTM).

14736 (DOE/PC/92147–6) **Catalytic multi-stage liquefaction of coal. Sixth quarterly report, 1 January 1994–31 March 1994.** Comolli, A.G.; Lee, L.K.; Pradhan, V.R.; Stalzer, R.H. Hydrocarbon Research, Inc., Princeton, NJ (United States). May 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92147. Order Number DE95005527. Source: OSTI; NTIS; GPO Dep.

The overall objective of this program is to produce liquid fuels from coal by direct liquefaction at a cost that is competitive with conventional fuels. Specifically, this continuous bench-scale program contains provisions to examine new ideas in areas such as low temperature pretreatments, more effective catalysts, on-line hydrotreating, new coal feedstocks, other hydrogen sources, more concentrated coal feeds and other highly responsive process improvements while assessing the design and economics of the bench-scale results. This quarterly report covers work on Laboratory Scale Studies, Continuous Bench-Scale Operations, Technical Assessment and Project Management.

14737 (DOE/PC/92147–8) **Catalytic multi-stage liquefaction of coal. Final eighth quarterly report, 1 July 1994–30 September 1994.** Comolli, A.G.; Johanson, E.S.; Lee, L.K.; Pradhan, V.R.; Stalzer, R.H. Hydrocarbon Research, Inc., Princeton, NJ (United States). Oct 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92147. Order Number DE95011365. Source: OSTI; NTIS; GPO Dep.

This quarterly report covers the activities of Catalytic Multi-Stage Liquefaction of Coal during the Period July 1–September 30, 1994, at Hydrocarbon Research, Inc. in Lawrenceville and Princeton, New Jersey. This DOE Contract Period is from December 8, 1992 to December 7, 1994. The overall objective of this program is to produce liquid fuels from coal by direct liquefaction at a cost that is competitive with conventional fuels. Specifically, this continuous bench-scale program contains provisions to examine new ideas in areas such as: low temperature pretreatments, more effective catalysts, on-line hydrotreating, new coal feedstocks, other hydrogen sources, more concentrated coal feeds and other highly responsive process improvements while assessing the design and economics of the bench-scale results. This quarterly report covers work on Laboratory Scale Studies, Continuous Bench-Scale Operations, Technical Assessment and Project Management.

14738 (DOE/PC/93205–T5) **Short contact time direct coal liquefaction using a novel batch reactor. Progress report, September 15, 1994–January 15, 1995.** Klein, M.T.; Calkins, W.H. Delaware Univ., Newark, DE (United States). 15 Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93205. Order Number DE95010365. Source: OSTI; NTIS; GPO Dep.

As has been stated in previous progress reports, the objective of this research is to optimize the design and operation of the bench scale batch reactor (SCTBR) for coal liquefaction at short contact times (0.01 to 10 minutes or longer). This reactor is simple enough in design and low enough in cost to serve as a suitable replacement for the traditional tubing-bomb reactors for many coal liquefaction and other high-pressure, high-temperature reaction studies. The liquefaction of selected Argonne Premium coals and the role of organic oxygen components of the coal and their reaction pathways during liquefaction at very low conversions are being investigated with this apparatus.

14739 (DOE/PC/93220–T5) **Production of elemental sulfur from H_2S and CO_2 derived from a coal desulfurization process. Quarterly technical progress report, October 1, 1994–December 31, 1994.** Jiang, Xueyu; Khang, Soon-Jai. Cincinnati Univ., OH (United States). Dept. of Chemical Engineering. [1995]. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93220. Order Number DE95010393. Source: OSTI; NTIS; GPO Dep.

During the fifth quarter of the project, temperature profile in the new reactor was measured under various conditions and result indicated that in the middle of the reactor (five to six inches in length) the temperature profile could be regarded as isothermal. X-ray diffraction was tried to determine the structure and composition of the CoO-MoO_3-alumina catalyst before and after the catalytic reaction. The results of X-ray diffraction showed that the catalyst was not in the crystal form, hence this method would not be applicable to this investigation. New flowmeters were replaced in the reaction system and calibrated to control the flowrate of H_2S, CO_2, H_2 and N_2. The experimental results from the quartz tube reactor were summarized. The results showed that H_2S conversion increased

with increasing temperature when used with the $CoO-MoO_3$-Alumina catalyst. Further thermodynamic analyses on conversion of H_2S, yield of S_2 and selectivity of S_2 were performed by using Stanjan method, which helped the interpreting of experimental results.

14740 (DOE/PC/94055–T1) **Technology development for iron Fischer-Tropsch catalysis. Quarterly technical progress report, October–December, 1994.** Kentucky Univ., Lexington, KY (United States). Research Foundation. [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-94PC94055. Order Number DE95009339. Source: OSTI; NTIS; GPO Dep.

Fischer-Tropsch catalysts must undergo a pretreatment in order to be active. As part of the authors comprehensive study to maximize the activity of iron based precipitated Fischer-Tropsch catalysts, they are currently attempting to optimize the activation procedure. Although they are able to achieve high activity using CO pretreatment, the catalysts tend to deactivate suddenly and rapidly after 500 hr of synthesis. Kolbel reports high CO conversion comparable to these results at a lower gas flow (2.4 vs. 3.4 nL/hr-g(Fe)); however, he achieved greater stability with conversions reported to be 90% after 1,400 hrs. One possibility for Kolbel's higher stability could be due to the activation procedure. Herein are reported the initial results of a study to optimize the catalyst composition and the operating conditions for the iron based slurry phase Fischer-Tropsch synthesis when synthesis gas activation is utilized.

14741 (ETDE/JP-mf–95769798) **Japan's New Sunshine Project. 1993 Annual Summary of Coal Liquefaction and Gasification.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Sep 1994. 202p. (In Japanese). Order Number DE95769798. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This report describes the achievement of coal liquefaction and gasification technology development in the New Sunshine Project for FY 1993. It presents the research and development of coal liquefaction technologies which includes studies on liquefaction characteristics of various coals and mechanism of catalytic reaction for liquefaction, the research and development of coal gasification technologies which includes studies on gasification characteristics of various coals and improvement of efficiency of coal gasification, the development of bituminous coal liquefaction which includes research of engineering, construction and operation of a 150 t/d bituminous coal liquefaction PP (pilot plant) and supporting research by a PSU (process supporting unit), the development of brown coal liquefaction which includes research on brown coal liquefaction with 50 t/d PP and development of techniques for upgrading coal oil from brown coal, the development of common base technologies which includes coal selection studies, research of upgrading technology of coal derived distillates and study on toxicological and environmental effects, the development of coal-based hydrogen production technology with a PP, the development of entrained flow coal gasification power generation plant, the assessment of coal hydrogasification, and the international co-operation. 110 figs., 41 tabs.

14742 (ETDE/JP-mf–95769799) **Symposium of Clean Coal Technology 1992.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). 2 Sep 1994. 78p. Order Number DE95769799. Source: OSTI; NTIS; Available from Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This proceedings compiles presentations for the Symposium on Clean Coal Technology 1992. Are compiled 'Strategy of clean coal technology in Japan' by NEDO, Japan, 'Status of Clean Coal Technology Demonstration Program of the United States Department of Energy' by U.S. Department of Energy, 'Clean coal technology, an option for Indonesia' by Department of Mines and Energy, Indonesia, 'Present status of clean coal technology development activities in Japan' by Center for Coal Utilization, Japan, 'Clean coal technology in Australia' by Department of Primary Industries and Energy, Australia, 'The present situation of coal combustion technology and the environmental impacts in China' by Ministry of Energy, China, and 'APEC clean coal activities' by East-West Center, USA. 21 figs., 10 tabs.

14743 (PNL-SA–24495) **Mechanisms of iron-based catalysis investigated using model compounds.** Linehan, J.C.; Matson, D.W.; Darab, J.G.; Autrey, S.T.; Franz, J.A.; Camaioni, D.M. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940813–39: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95007815. Source: OSTI; NTIS; GPO Dep.

The catalytic mechanism of highly active, nanophase, iron-based coal liquefaction catalysts was investigated using a series of model compounds. The iron-oxide phases ferric oxyhydroxysulfate (OHS), 6-line ferrihydrite, hematite, and goethite, were evaluated as catalyst precursors with systematically substituted diphenylmethanes in the presence of a hydrogen donating solvent. The activity of the catalysts was observed to be dependent upon the functionality on the model compounds. The results of these model compound studies and their relationship to possible reaction mechanisms are presented.

0105 Products and By-Products

14744 (DOE/MC/30251–3975) **High-volume, high-value usage of Flue Gas Desulfurization (FGD) by-products in underground mines Phase 1: Laboratory investigations. Quarterly report, July 1994–September 1994.** Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research. Dec 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30251. Order Number DE95000059. Source: OSTI; NTIS; GPO Dep.

During the quarter a second series of samples were collected and partially characterized chemically and mineralogically. The samples were collected at the disposal site operated by Freeman United Coal Co. The second collection was necessary because of deterioration due to hydration of the original samples. A study of the hydration characteristics was completed during the quarter. Important reactions included the immediate formation of ettringite and portlandite. The hydration and transformation was found to be a slow process. A second phase of gypsum formation from ettringite deterioration was identified. The slow hydration of anhydrite with its resultant swell is a potential problem which will be addressed further. Geotechnical characterization, during the quarter included completion of the preliminary characterization, analysis of the findings, experimentation with sample preparation for the final characterization/mix design, and design of the final experimental program. The analysis of the coals collected during the core drilling and hydrologic planning were completed. Also during the quarter a meeting was held with representatives of the shotcrete industry to discuss transport systems for emplacement. The pros and cons of pneumatic and hydraulic systems were discussed and plans formulated for further investigations.

0106 Properties and Composition

Refer also to citation(s) 15248, 16147

14745 (DOE/PC/89757–T1) **Coal surface structure and thermodynamics. Final report.** Larsen, J.W.; Wernett, P.C.; Glass, A.S.; Quay, D.; Roberts, J. Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry. May 1994. 413p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89PC89757. Order Number DE95005301. Source: OSTI; NTIS; GPO Dep.

Coals surfaces were studied using static surface adsorption measurements, low angle x-ray scattering (LAXS), inverse gas chromatography (IGC) and a new ^{13}C NMR relaxation technique. A comparison of surface areas determined by hydrocarbon gas adsorption and LAXS led to the twin conclusions that the hydrocarbons had to diffuse through the solid to reach isolated pores and that the coal pores do not form interconnected networks, but are largely isolated. This conclusion was confirmed when IGC data for

small hydrocarbons showed no discontinuities in their size dependence as usually observed with porous solids. IGC is capable of providing adsorption thermodynamics of gases on coal surfaces. The interactions of non-polar molecules and coal surfaces are directly proportioned to the gas molecular polarizability. For bases, the adsorption enthalpy is equal to the polarizability interaction plus the heat of hydrogen bond formation with phenol. Amphoteric molecules have more complex interactions. Mineral matter can have highly specific effects on surface interactions, but with most of the molecules studied is not an important factor.

14746 (DOE/PC/92527–T9) **Hindered diffusion of coal liquids. Quarterly report No. 9, September 18, 1994–December 17, 1994.** Tsotsis, T.T. (Univ. of Southern California, Los Angeles, CA (United States). Dept. of Chemical Engineering); Sahimi, M.; Webster, I.A. University of Southern California, Los Angeles, CA (United States). Dept. of Chemical Engineering. [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92527. Order Number DE95010364. Source: OSTI; NTIS; GPO Dep.

The design of industrial catalysts requires that the diffusivity of the reacting species within the catalyst be accurately known. Nowhere is this more important than in the area of coal liquefaction and upgrading of coal liquids. In this area, one is faced with the task of processing a number of heavy oils, containing metals and other contaminants, in a variety of process dependent solvents. It is important, therefore, on the basis of predicting catalyst activity, selectivity, and optimizing reactor performance, that the diffusivities of these oil species be accurately known.

14747 (DOE/PC/92544–10) **Vapor pressures and heats of vaporization of primary coal tars. Quarterly technical progress report, 1 October–31 December 1994.** Suuberg, E.M. Brown Univ., Providence, RI (United States). Div. of Engineering. [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92544. Order Number DE95009632. Source: OSTI; NTIS; GPO Dep.

The vapor pressure correlations that exist at present for coal tars are very crude and they are not considered reliable to even an order of magnitude when applied to tars. The present project seeks to address this important gap in the near term by direct measurement of vapor pressures of coal tar fractions, by application of well-established techniques and modifications thereof. The principal objectives of the program are to: (1) obtain data on the vapor pressures and heats of vaporization of tars from a range of ranks of coal, (2) develop correlations based on a minimum set of conveniently measurable characteristics of the tars, and (3) develop equipment that would allow performing such measurements in a reliable, straightforward fashion. A significant amount of time has been devoted during this quarter to testing the equipment for measurements by the gas saturation method and the Knudsen effusion method. These techniques are beginning to yield reliable results. Some key features of the methods are summarized, and sample results presented.

14748 (DOE/PC/93223–T4) **Surface properties of photo-oxidized bituminous coals. Technical progress report, October 1994–December 1994.** Mitchell, G.; Davis, A.; Chander, S. Pennsylvania State Univ., University Park, PA (United States). Feb 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93223. Order Number DE95010394. Source: OSTI; NTIS; GPO Dep.

During this report period, results were obtained from coal samples photo-oxidized in blue light for evaluation by Secondary Ion Mass Spectrometry (SIMS) at the University of New South Wales and by Scanning Transmission X-ray Microscopy (STXM) at Brookhaven National Laboratory. SIMS analyses of the Pittsburgh seam coal showed that considerably more ions were generated from the photo-oxidized surface compared with the fresh. Also, a higher concentration of molecular fragments with oxygen-containing and C-C double bonded functional groups were obtained from the irradiated surface. Because these measurements were qualitative, it was suggested that X-ray Photoelectron Spectroscopy (XPS) may be an alternative means of determining the concentration of total oxygen content at the coal surface. In addition to XPS of the current sample, another sample of the Pittsburgh seam vitrinite with areas of 100 μm irradiated for different times (1, 5 and 10 min) was provided to the University of New South Wales in mid-November. Results obtained from the STXM technique are informative. Evaluation of C-NEXAFS spectra obtained in the region of 280 to 300 eV from both coals and for areas irradiated for different times showed significant differences in the intensity of energy bands assigned to CH_3 (285.5 eV), OH (287 eV) and C=O (289.5 eV) functional groups attached to aromatic rings.

14749 (DOE/PC/94226–T1) **Development of a video-based slurry sensor for on-line ash analysis. First quarterly technical progress report, October 1, 1994–December 31, 1994.** Adel, G.T.; Luttrell, G.H. Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Dept. of Mining and Minerals Engineering. 28 Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94226. Order Number DE95010366. Source: OSTI; NTIS; GPO Dep.

Automatic control of fine coal cleaning circuits has traditionally been limited by the lack of sensors for on-line ash analysis. Although several nuclear-based analyzers are available, none have seen widespread acceptance. This is largely due to the fact that nuclear sensors are expensive and tend to be influenced by changes in seam type and pyrite content. Recently, researchers at VPI&SU have developed an optical sensor for phosphate analysis. The sensor uses image processing technology to analyze video images of phosphate ore. It is currently being used by Texasgulf for off-line analysis of dry flotation concentrates. The primary advantages of optical sensors over nuclear sensors are that they are significantly cheaper, are not subject to measurement variations due to changes in high atomic number minerals, are inherently safer and require no special radiation permitting. The purpose of this work is to apply the knowledge gained in the development of an optical phosphate analyzer to the development of an on-line ash analyzer for fine coal slurries. During the past quarter, all project planning was completed and an agreement was reached with Pittston Coal Company whereby the Middle Fork preparation plant would serve as the industrial test site for the optical sensor. In addition, all equipment was purchased for constructing the sensor and two prototype sample presentation systems were developed. Test work is currently underway to evaluate the performance of these sample presentation systems.

0108 Waste Management

Refer also to citation(s) 15374, 15375

14750 (DOE/MC/28060–95/C0443) **A field demonstration of the use of wet and dry scrubber sludges in engineered structures.** Wolfe, W.E. (Dravo Lime Co., Pittsburgh, PA (United States)); Cline, J.H. Dravo Lime Co., Pittsburgh, PA (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28060. (CONF-950106–1: 11. international symposium on use and management of coal combustion by-products (CCBs), Orlando, FL (United States), 15-19 Jan 1995). Order Number DE95008360. Source: OSTI; NTIS; GPO Dep.

In a research program being performed at The Ohio State University, the agronomic and engineering properties of flue gas desulfurization by-products are being evaluated. The purpose of this project is to identify potentially beneficial uses for these materials and in so doing reduce the amount of by-product that must be disposed of in landfills. The results of the experimental program have demonstrated that FGD by-products possess the physical properties that should make them suitable for use as a select fill in a variety of construction projects. To verify the laboratory findings on a larger scale, work was begun on a number of field demonstration projects in which the behavior of the FGD could be evaluated under actual field conditions. Two of these field projects were conducted at an Ohio State University research farm where both wet and dry FGD materials were used to stabilize the soil bases in cattle feedlots. Ash from American Electric Power's Tidd PFBC plant in Brilliant, Ohio was placed in three lots each designed to accommodate approximately fifty animals. Stability wet scrubber sludge from AEP's Conesville, Ohio plant was placed at two hay bale storage and Winter feeding sites. The construction of

the test plots is described. Visual inspections of the plots as well as laboratory tests on samples of the by-product collected at several times during the months since the FGD bases installed have shown that in general, the materials have performed satisfactorily.

14751 (DOE/MC/28060–95/C0445) **Use of clean coal technology by-products as agricultural liming techniques.** Stehouwer, R.C. (Ohio Agricultural Research and Development Center, Wooster, OH (United States). Dept. of Agronomy); Sutton, P.; Dick, W.A. Dravo Lime Co., Pittsburgh, PA (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28060. (CONF-950106–2: 11. international symposium on use and management of coal combustion by-products (CCBs), Orlando, FL (United States), 15-19 Jan 1995). Order Number DE95008359. Source: OSTI; NTIS; GPO Dep.

Dry flue gas desulfurization (FGD) by-products are mixtures of coal fly-ash, anhydrite ($CaCO_4$), and unspent lime- or limestone-based sorbent. Dry FGD by-products frequently have neutralizing values greater than 50% $CaCO_3$ equivalency and thus have potential for neutralizing acidic soils. Owing to the presence of soluble salts and various trace elements, however, soil application of dry FGD by-products may have adverse effects on plant growth and soil quality. The use of a dry FGD by-product as a limestone substitute was investigated in a field study on three acidic agricultural soils (pH 4.6, 4.8, and 5.8) in eastern Ohio. The by-product (60% $CaCO_3$ equivalency) was applied in September, 1992, at rates of 0, 0.5, 1.0, and 2.0 times the lime requirement of the soils, and alfalfa (Medicago sativa L.) and corn (Zea mays L.) were planted. Soils were sampled immediately after FGD application and three more times every six months thereafter. Samples were analyzed for pH and water soluble concentrations of 28 elements. Soil pH was increased by all FGD rates in the zone of incorporation (0–10 cm), with the highest rates giving a pH slightly above 7. Within one year pH increases could be detected at depths up to 30 cm. Calcium, Mg, and S increased, and Al, Mn, and Fe decreased with increasing dry FGD application rates. No trace element concentrations were changed by dry FGD application except B which was increased in the zone of incorporation. Dry FGD increased alfalfa yield on all three soils, and had no effect on corn yield. No detrimental effects on soil quality were observed.

14752 (DOE/MC/29244–4038) **Disposal of fluidized bed combustion ash in an underground mine to control acid mine drainage and subsidence. Progress report, September 1, 1994–November 30, 1994.** West Virginia Univ., Morgantown, WV (United States). [1994]. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC29244. Order Number DE95011400. Source: OSTI; NTIS; GPO Dep.

During Phase I (first 18 months) the project is segregated into four areas of reporting: (A) Grout Formulation, (B) Grout Characterization, (C) Water Quality Monitoring, (D) Subsidence Control & Contaminant Transport. The first component involves formulating a grout mixture with appropriate flowability and strength (flow and strength requirements will be set by other components) to be used in filling complex mine voids. The Grout Characterization component will determine the flowability characteristics of the formulated grout and model the flow of the grout filling the mine void. The Water Quality component involves background monitoring of water quality and precipitation at the Phase III (Longridge) mine site. The last component involves evaluating the strength requirements and the migration of contaminants through the candidate grouts. This report separately discusses progress on all components of the program in order of project subtask. The subtasks are arranged according to the Network Diagram on the following pages. Progress for each subtask can be seen in the Gantt Chart following the Network Diagram.

14753 (DOE/PC/89881–T12) **Microbial recovery of metals from spent coal liquefaction catalysts. Quarterly report, January–March, 1992.** Sperl, P.L.; Sperl, G.T. Geo-Microbial Technologies, Inc., Ochelata, OK (United States). [1992]. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89PC89881. Order Number DE95009684. Source: OSTI; NTIS; GPO Dep.

During March the authors began the leaching of the extracted catalyst with denitrifying bacteria. The results are shown in the attached Figures. They found that the solvent has a great effect on the ability of the denitrifying bacteria to release the metals from the catalyst matrix, while the catalyst remains in whole particles. Subsequent to this they will test ground catalyst to determine if the solvent effects are real or not. It is possible that some solvents do a better job of removing surface poisoning materials from the catalyst, but if the catalyst is ground, the choice of solvent may not be as important. The results clearly show that Ni and Mo are rapidly released from solvent-washed spent catalyst by denitrifying bacteria. There also appears to be a predominant selectivity for Mo over Ni with most solvents as washing agents and whole catalyst particles. However, when the catalyst is crushed, this preference is not as pronounced. The net effect is probably a combination of the increase in surface area allowing better non-microbiological dissolution of the NiS as well as increasing the surface area exposed to the action of the microorganisms.

14754 (DOE/PC/89881–T13) **Microbial recovery of metals from spent coal liquefaction catalysts. Quarterly report, April–June, 1992.** Sperl, P.L.; Sperl, G.T. Geo-Microbial Technologies, Inc., Ochelata, OK (United States). [1992]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89PC89881. Order Number DE95009685. Source: OSTI; NTIS; GPO Dep.

During April and May the authors began the rather laborious task of crushing each of the solvent-extracted catalyst samples for the determination of the effect of crushing on leaching rate and percent metal recovered. The crushing of these catalyst samples employed a ball mill and it took approximately 1 week to crush each sample. All catalyst samples, after crushing, were sieved to a particle size of >100 mesh. Samples of 10, and 40 mesh were also collected, but only the >100 mesh was subjected to bacterial leaching. These samples were tested using denitrifying bacteria for their ability to release Ni and Mo from these samples. The data are shown in the attached figures as well as comparisons for rates of Ni and Mo released in relation to catalyst solvent pretreatment. These data were obtained with citrate as a carbon and energy source for the microorganisms. It is quite clear that crushing the catalyst allows for a more rapid release of these metals from the catalyst samples, regardless of the organic solvent used to pretreat the catalyst. However, the effects of the different solvents are still evident, although not as striking, after the catalysts are crushed (see previous reports). There also still appears to be a greater ease in removing Mo over Ni, a case particularly prevalent if ethyl acetate, methanol or xylene is used as the pretreatment solvent. In any case, it appears that a variety of solvents will be useful and that an optimized system could yield >90% release and recovery of both Ni and Mo in as little as 10 days of treatment. Experimental data are enclosed.

14755 (DOE/PC/90362–T1-Vol.1) **Enhanced NO_x removal in wet scrubbers using metal chelates. Final report, Volume 1.** Smith, K. (Dravo Lime Co., Pittsburgh, PA (United States)); Lani, B.; Berisko, D.; Schultz, C.; Carlson, W.; Benson, L.B. Dravo Lime Co., Pittsburgh, PA (United States). Dec 1992. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90362. Order Number DE95004263. Source: OSTI; NTIS; GPO Dep.

Successful pilot plant tests of simultaneous removal of $S0_2$ and NO_x in a wet lime flue gas desulfurization system were concluded in December. The tests, at up to 1.5 MW(e) capacity, were conducted by the Cincinnati Gas and Electric Company and Dravo Lime Company for the US Department of Energy at a pilot facility at the Miami Fort station of CG&E near Cincinnati, Ohio. The pilot plant scrubbed a slipstream of flue gas from Unit 7, a 530 MW coal-fired electric generating unit. Tests were conducted in three phases between April and December. The technology tested was wet scrubbing with Thiosorbic® magnesium-enhanced lime for $S0_2$ removal and simultaneous NO scrubbing with ferrous EDTA, a metal chelate. Magnesium-enhanced lime-based wet scrubbing is used at 20 full-scale high-sulfur coal-fired electric generating units with a combined capacity of 8500 NW. Ferrous EDTA reacts with

nitric oxide, NO, which comprises about 95% of NO_x from coal-fired boilers. In this report, although not precise, NO and NO_x are used interchangably. A major objective of the tests was to combine NO_x removal using ferrous EDTA, a developing technology, with SO_2 removal using wet lime FGD, already in wide commercial use. If successful, this could allow wide application of this NO_x removal technology.

14756 (DOE/PC/90364–T9) **Flue gas conditioning for improved particle collection in electrostatic precipitators. Third topical report, Results of performance testing of additives.** ADA Technologies, Inc., Englewood, CO (United States). 7 Apr 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90364. (ADA–4300-95-T3). Order Number DE95011397. Source: OSTI; NTIS; GPO Dep.

The purpose of this research program is to identify, evaluate, and develop cost-effective electrostatic precipitators (ESP) conditioning agents to improve removal of fine particle air toxics from coal-fired combustion flue gas streams. This goal can be met by reduction of reentrainment losses of collected ash and by control of ash resistivity. The project has focused on the development of cohesive agents to overcome reentrainment problems associated with low particle holding force. This effort has encompassed an extensive laboratory screening, followed by bench-scale and pilot-scale tests at the Consol research coal combustion facility. Initial laboratory screening with a variety of agents indicated qualitative improvements in ash layer mechanical characteristics. Further tests at the pilot-scale were inconclusive, in part because it was found to be difficult to develop low resistivity reentrainment conditions in the pilot-scale ESP available to the project. Results of the bench-scale and pilot-scale tests at Consol's coal combustor are presented in previous project reports.

14757 (DOE/PC/90547–T17) **Evaluation of gas-reburning and low NO_x burners on a wall fired boiler. Technical progress report number 17, October 1–December 31, 1994.** Energy and Environmental Research Corp., Irvine, CA (United States). 13 Dec 1994. 17p. Sponsored by USDOE, Washington, DC (United States);Gas Research Inst., Chicago, IL (United States);Colorado Interstate Gas Co., Colorado Springs, CO (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract FC22-91PC90547. Order Number DE95009351. Source: OSTI; NTIS; GPO Dep.

The primary objective of this CCT project is to evaluate the use of Gas Reburning and Low NO_x Burners (GR-LNB) for NO_x emission control from a wall fired boiler. Low NO_x burners are designed to delay the mixing of the coal fuel with combustion air to minimize the NO_x formation. With GR, about 80–85% of the coal fuel is fired in the main combustion zone. The balance of the fuel is added downstream as natural gas to create a slightly fuel rich environment in which NO_x is converted to N_2. The combustion process is completed by over fire air addition. SO_x emissions are reduced to the extent that natural gas replaces sulfur-containing coal. The level of NO_x reduction achievable with 15–20% natural gas is on the order of 50–60%. Thus the emission reduction target of the combination of these two developed technologies is about 70%. This project is being conducted in three phases at the host site, a 172 MW wall fired boiler of Public Service Company of Colorado (PSCo), Cherokee Unit 3 in Denver, Colorado: Phase 1–Design and Permitting; Phase 2–Construction and Start-up; and Phase 3–Operation, Data Collection, Reporting and Disposition. Phase 3 activities during this reporting period involved initiation of the second generation gas reburning parametric testing. This technology utilizes enhanced natural gas and overfire air injectors with elimination of the flue gas recirculation system. The objective is to demonstrate NO_x reductions similar to that of long term testing but with a reduced capital cost requirement through elimination of the FGR system.

14758 (DOE/PC/91293–13) **Direct catalytic decomposition of nitric oxide. Quarterly technical progress report No. 13, October–December 1994.** Flytzani-Stephanopoulos, M.; Sarofim, A.F.; Zhang, Yanping. Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Chemical Engineering. [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91293. Order Number DE95010500. Source: OSTI; NTIS; GPO Dep.

This project investigates a suitable catalyst system for direct NO decomposition in post-combustion gas streams. This process does not use a reductant, such as the ammonia used in Selective Catalytic Reduction (SCR) of NO_x to nitrogen. Therefore, it is a greatly simplified process involving passing the flue gas through a catalytic converter. Catalysts are prepared by incorporating metal cations into zeolite supports according to ion exchange procedures widely used in preparation of metal/zeolite catalysts. The catalysts of primary interest are copper, cerium, palladium, silver, and nickel exchanged ZSM-5 catalysts. Particular emphasis is given in this work on promoted Cu-ZSM-5 zeolites, especially the catalyst system Mg/Cu-ZSM-5, Ce/Cu-ZSM-5 and a few others, which are promising for NO conversion to nitrogen at typical flue gas 0_2 and NO levels and over the temperature range of 723–873K. The effect of zeolite modification, copper exchange level and catalyst preparation conditions on the catalyst activity are studied in a packed-bed microreactor. Kinetic studies of NO and 0_2 interaction with catalysts over a wide temperature range as well as catalyst structural investigations by STEM/EDX, XRD, and XPS are aimed at elucidating the role of cocation on the copper ion activity and stability in dry and wet reaction mixtures. During this quarter, the atomic ratios of copper, cerium, oxygen, and silicon on the surface of fresh, and used Cu-ZSM-5 and Ce/Cu-ZSM-5 catalysts were measured by x-ray-excited photoelectron spectroscopy (XPS). Dynamic change of copper with treatment of the samples was identified. Enrichment of copper was found in hydrated and steamed samples, while copper migrated into zeolite channels after the samples were heated in dry gas streams. Cerium was highly concentrated on the zeolite surface regions, and was much less mobile than copper.

14759 (DOE/PC/91336–T6) **Low temperature SO_2 removal with solid sorbents in a circulating fluidized bed absorber. Final report.** Lee, S.K.; Keener, T.C. Cincinnati Univ., OH (United States). Dept. of Civil and Environmental Engineering. 10 Oct 1994. 176p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91336. Order Number DE95009347. Source: OSTI; NTIS; GPO Dep.

A novel flue gas desulfurization technology has been developed at the University of Cincinnati incorporating a circulating fluidized bed absorber (CFBA) reactor with dry sorbent. The main features of CFBA are high sorbent/gas mixing ratios, excellent heat and mass transfer characteristics, and the ability to recycle partially utilized sorbent. Subsequently, higher SO_2 removal efficiencies with higher overall sorbent utilization can be realized compared with other dry sorbent injection scrubber systems.

14760 (DOE/PC/92534–7) **Selective catalytic reduction of sulfur dioxide to elemental sulfur. Quarterly technical progress report No. 7, January–March 1994.** Liu, Wei; Flytzani-Stephanopoulos, M.; Sarofim, A.F. Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Chemical Engineering. [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92534. Order Number DE95010499. Source: OSTI; NTIS; GPO Dep.

Elemental sulfur recovery from $S0_2$-containing gas stream is highly attractive as it produces a salable product and no waste to dispose of However, commercially available schemes are complex and involve multistage reactors, such as, most notably in the Resox (reduction of $S0_2$ with coke) and Claus plant (reaction of $S0_2$ with H_2S over catalyst). This project will investigate a cerium oxide catalyst for the single stage selective reduction of $S0_2$ to elemental sulfur by a reductant, such as carbon monoxide. Cerium oxide has been identified in recent work at MIT as a superior catalyst for $S0_2$ reduction by CO to elemental sulfur because its high activity and high selectivity to sulfur over COS over a wide temperature range (400–650°C). The detailed kinetic and parametric studies of $S0_2$ reduction planned in this work over various CeO_2-formulations will provide the necessary basis for development of a very simplified process, namely that of a single-stage elemental sulfur recovery scheme from variable concentration gas streams. The potential cost- and energy-efficiency benefits from this approach can not be overstated. A first apparent application is treatment of a regenerator off-gases in power plants using regenerative flue gas desulfurization. Such a simple catalytic converter may offer the long-sought "Claus-alternative" for coal-fired power plant applications.

14761 (DOE/PC/92535–T9) **Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA. Final project report, July 1, 1992–December 31, 1994.** Levendis, Y.A. Northeastern Univ., Boston, MA (United States). [1995]. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92535. Order Number DE95009338. Source: OSTI; NTIS; GPO Dep.

A study was conducted to determine the efficacy of carboxylic calcium and magnesium salts (e.g., calcium magnesium acetate or CMA, $CaMg_2(CH_2COOH)_6$) for the simultaneous removal of SO_2 and NO_x in oxygen-lean atmospheres. Experiments were performed in a high-temperature furnace that simulated the post-flame environment of a coal-fired boiler by providing similar temperatures and partial pressures of SO_2, NO_x CO_2 and O_2. When injected into a hot environment, the salts calcined and formed highly porous "popcorn"-like cenospheres. Residual MgO and/or $CaCO_3$ and CaO reacted heterogeneously with SO_2 to form $MgSO_4$ and/or $CaCO_4$. The organic components - which can be manufactured from wastes such as sewage sludge - gasified and reduced $NO_x$to N_2 efficiently if the atmosphere was moderately fuel-rich. Dry-injected CMA particles at a Ca/S ratio of 2, residence time of 1 second and bulk equivalence ratio of 1.3 removed over 90% of SO_2 and NO_x at gas temperatures $\geq$ 950°C. When the furnace isothermal zone was $\leq$ 950°C, Ca was essentially inert in the furnace quenching zone, while Mg continued to sorb SO_2 as the gas temperature cooled at a rate of -130°C/sec. Hence, the removal of SO_2 by CMA could continue for nearly the entire residence time of emissions in the exhaust stream of a power plant. Additional research is needed to improve the efficiency and reduce the cost of the relatively expensive carboxylic acid salts as dual SO_2-NO_x reduction agents. For example, wet injection of the salts could be combined with less expensive hydrocarbons such as lignite or even polymers such as poly(ethylene) that could be extracted from the municipal waste stream.

14762 (DOE/PC/92548–T9) **Suppression of fine ash formation in pulverized coal flames. Quarterly technical progress report No. 9, October 1, 1994–December 31, 1994.** Kramlich, J.C.; Chenevert, B.; Park, Junesung. Washington Univ., Seattle, WA (United States). Dept. of Mechanical Engineering. 1 Mar 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92548. Order Number DE95010633. Source: OSTI; NTIS; GPO Dep.

The goals of the present program are threefold. First, the authors wish to perform measurements on carefully characterized coals to identify the means by which the coal treatment increases aerosol yields. Second, the authors investigate means by which coal cleaning can be done in a way that will not increase aerosol yields. Finally, the authors identify whether this mechanism can be used to reduce aerosol yields from systems burning straight coal.

14763 (OCDO–95010443) **Direct sulfur recovery during sorbent regeneration. Final report.** Nelson, S.G. (Sorbent Technologies Corp., Twinsburg, OH (United States)); Little, R.C. Ohio Coal Development Office, Columbus, OH (United States); Sorbent Technologies Corp., Twinsburg, OH (United States). Aug 1993. 50p. Sponsored by Ohio State Government, Columbus, OH (United States). Source: OSTI; Ohio Coal Development Office, 77 S. High Street, P.O. Box 1001, Columbus, OH 43266-001 (United States).

The objective of this research project was to improve the direct elemental sulfur yields that occur during the regeneration of SO_2-saturated MgO-vermiculite sorbents (MagSorbents) by examining three approaches or strategies. The three approaches were regeneration-gas recycle, high-pressure regeneration, and catalytic reduction of the SO_2 gas using a new catalyst developed by Research Triangle Institute (RTI). Prior to the project, Sorbent Technologies Corporation (Sorbtech) had developed a sorbent-regeneration process that yielded directly a pure elemental sulfur product. In the process, typically about 25 to 35 percent of the liberated $S0_2$ was converted directly to elemental sulfur. The goal of this project was to achieve a conversion rate of over 90 percent. Good success was attained in the project. About 90 percent or more conversion was achieved with two of the approaches that were examined, regeneration-gas recycle and use of the RTI catalyst. Of these approaches, regeneration-gas recycle gave the best results (essentially 100 percent conversion in some cases). In the regeneration-gas recycle approach, saturated sorbent is simply heated to about 750°C in a reducing gas (methane) atmosphere. During heating, a gas containing elemental sulfur, water vapor, H_2S, $S0_2$, and $C0_2$ is evolved. The elemental sulfur and water vapor in the gas stream are condensed and removed, and the remaining gas is recycled back through the sorbent bed. After several recycles, the $S0_2$ and H_2S completely disappear from the gas stream, and the stream contains only elemental sulfur, water vapor and $C0_2$.

0109 Environmental Aspects

Refer also to citation(s) 14770, 14793, 14794

14764 (BARC–1994/E/034) **Composition and leachability of trace elements in coal ash and their migration in ground water at thermal power plant site at Manuguru.** Sadasivan, S. (Bhabha Atomic Research Centre, Bombay (India). Environmental Assessment Div.); Meenakshy, V.; Negi, B.S.; Nair, R.N.; Krishnamoorthy, T.M.; Nambi, K.S.V. Bhabha Atomic Research Centre, Bombay (India). 1994. 57p. Order Number DE95627842. Source: OSTI; NTIS (US Sales Only); INIS.

The Heavy Water Board at Manuguru has a captive power plant using 2500 tpd of coal producing about 1000 tpd of ash. The possible toxic metal contamination of ground water due to leaching of the ash (so that toxic elements do not seep through one pond and contaminate the ground water) are assessed. Samples of coal, fly ash, bottom ash, ash pond overflow water, river water, ash pond slurry, soil (surface and depth) were analysed for major and trace element contents using EDXRF, INAA, AAS, and Anodic Stripping Voltammetry. The cation exchange capacity of the underlying soil and the fly ash were determined by standard method using calcium as the cation indicator. The redox potential and the pH of the samples were measured by using Pt/Mo and glass/calomel system respectively. The size distribution of fly ash particles were also determined. The study conclusively shows that the leach percent being very small and the soil having good cation exchange capacity there is negligible probability of contamination of ground water from ash pond and therefore there is no dire need for providing any impervious lining for the ash pond. (author). 23 refs., 19 tabs., 16 figs., 1 appendix.

14765 (ETDE-DE–75) **Reconstruction and recultivation in the Lausitz brown coal district. Ecological aims and economical chances.** Reihe 'Wirtschaftspolitische Diskurse', v. 60. Forschungsinstitut der Friedrich-Ebert-Stiftung e.V., Bonn (Germany). Abt. Wirtschaftspolitik. Aug 1994. 41p. (In German). (CONF-9405306–: Technical conference on reconstruction, recultivation and subsequent use of open-cast mining surfaces, Ruhland (Germany), 31 May 1994). Order Number DE95768933. Source: OSTI; NTIS (US Sales Only).

Even as recently as in 1988, 310 million tonnes of brown coal were extracted in what was then the German Democratic Republic. Environmental pollution and nature destruction on a scale hardly imaginable were the consequences of such aggressive and recklessly extended mining. - After 1989, brown coal extraction decreased dramatically. In the Lausitz district, whose economic structure depended entirely on coal and which became the energy center of the former GDR, coal extraction and mining activities have more than halved during the last four years. - The remediation of landscape destruction and land pollution from mining must now be accompanied by thorough structural change. Exhausted open-pit mines and residual depressions must be freed from contaminants, cleaned up and revegetated; in destroyed landscapes an efficient natural cycle must be re-established. The reclaimed mining sites will be turned into areas with stands of mixed forest and wet biotopes, but also lakes and recreation areas. Beyond ecological regeneration and landscape reconstruction, the redevelopment and revegetation work possesses considerable employment potential for the foreseeable period of time. Herein lies a chance for overcoming the consequences of the brown coal monostructure and developing a viable industry and dynamic trade. (orig.)

14766 (IAEA-TECDOC–787) **Guidelines for comparative assessment of the environmental impacts of wastes from electricity generation systems. A framework for the assessment and comparison of environmental impacts.** International Atomic Energy Agency, Vienna (Austria). Feb 1995. 61p. Order Number DE95627817. Source: OSTI; NTIS (US Sales Only); INIS.

The report describes the initial phase of a project intended to provide guidance to those concerned with environmental aspects of solid and hazardous waste management in electrical energy production systems. The focus is on describing a methodology for assessing and comparing the environmental impact arising from these wastes, and thereby to provide an input to overall electrical generation comparison projects, such as DECADES. The structure of the report is as follows: after considering a range of electrical energy production systems with an outline discussion of the waste streams produced in each case, the relevant treatment technologies and disposal options are reviewed. Then the elements of the framework for comparative assessment proposed in this report are described. The types of environmental impact, environmental protection criteria and indicators or end-points to measure the impact, the way in which such impacts can be quantitatively assessed and compared are discussed. 59 refs, figs and tabs.

0120 Mining

Refer also to citation(s) 14744

14767 (ETDE-DE–64) **Report on the activities of the mining authorities in the Land North-Rhine Westphalia in 1993/94.** Ministerium fuer Wirtschaft, Mittelstand und Technologie des Landes Nordrhein-Westfalen, Duesseldorf (Germany). Jan 1995. 112p. (In German). Order Number DE95768626. Source: OSTI; NTIS (US Sales Only).

A survey of the economic situation of individual branches of the mining industry and the structure and responsibility of the mining authorities is followed by a description of the activities in the fields of mining technology and safety, work safety, health protection and environment. (orig.)

14768 (ETDE-DE–65) **Development and testing of an automatic coupling/uncoupling system for mine cars in view of reducing accident risks and manual workload. Final report.** Urbainczyk, W. Ruhrkohle Niederrhein AG/Ruhrkohle Westfalen AG, Herne (Germany). Mar 1994. 82p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01HD107. Order Number DE95769225. Source: OSTI; NTIS (US Sales Only).

The development of an automatic coupling/uncoupling device for all shackle-type couplings which clutches the couplings and, without stopping the train, runs the coupling by microprocessor control on the train in motion, is to create the prerequisites for humanization of the highly risk-laden work of the shunter in charge of coupling/uncoupling. One prototype of a coupling and one prototype of an uncoupling device were designed and built. Subsequent to rig tests with the manufacturer, both devices were installed on Walsum colliery, and tested. The result was unsatisfactory for the uncoupling device. The result of the coupling device test was better but, also in this case, further amendments are necessary to arrive at operational reliability. (orig.)

14769 (ETDE-DE–81) **Coal mining situation in the Federal Republic of Germany 1994.** Statistik der Kohlenwirtschaft e.V., Essen (Germany). 6 Mar 1995. 17p. (In German). Order Number DE95769892. Source: OSTI; NTIS (US Sales Only).

The report provides up-to-date information on the German coal mining industry for the reporting time period. Data on coal mining as well as on brown coal mining cover: production, stocks, productivity, employees, sales, imports and exports of coal and coal products. (orig.)

0140 Combustion

Refer also to citation(s) 14725, 14752, 14757, 14796, 15240, 15371, 15780, 15913

14770 (ANL/DIS/TM–22) **Coal use in the People's Republic of China, Volume 2: The economic effects of constraining coal utilization.** Rose, A. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Mineral Economics); Lim, D.; Frias, O.; Benavides, J.; Tompkins, M.M. Argonne National Lab., IL (United States). Dec 1994. 168p. DOE Contract W-31109-ENG-38. Order Number DE95008349. Source: OSTI; NTIS; GPO Dep.

The People's Republic of China (hereafter referred to as China) is the largest producer and consumer of coal in the world. The dominance of coal in China's energy balance has come at a high price to the environment. With the recent attention given to global warming issues, China's energy consumption and production practices have become the subject of much concern. Of particular concern is China's ability to reduce CO_2 emissions by constraining coal use and the impact such policies will likely have on the Chinese economy. The study is divided into two reports. Volume 1 focuses on the full coal fuel cycle, emissions, and environmental effects. This report (Volume 2) analyzes various CO_2 mitigation strategies and determines their effect on economic growth. Contrary to what some analysts have claimed, the current work suggests that it would not be costly for the Chinese to reduce CO_2 emissions. In fact, some strategies were accompanied by increases in China's energy and economic efficiency, which actually stimulated economic growth.

14771 (DOE/ET/15601–T69) **Multi-color pyrometer temperature measurement system. Topical report 10.** Green, R.A.; Philip, T. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95009825. Source: OSTI; NTIS; GPO Dep.

The Multi-Color Pyrometer System is one of the advanced optical diagnostic instruments developed at DIAL to measure temperatures in the coal combustion environments of large scale facilities. The principles of operation, a description of the system and its capabilities, and the operational details of this instrument are presented in this report.

14772 (DOE/MC/24132–4026) **Tidd PFBC demonstration project: Technical progress report, third quarter 1994.** American Electric Power Service Corp., Columbus, OH (United States). Oct 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24132. Order Number DE95010528. Source: OSTI; NTIS; GPO Dep.

This is the 30th Technical Progress Report submitted to the Department of Energy in connection with the Cooperative Agreement between the DOE and the Ohio Power Company for the Tidd PFBC Demonstration Plant. This report covers the period from July 1, 1994 to September 30, 1994. Major activities during this period include: the unit operated for 1,214 hours on coal, bringing the grand total for coal fire through the end of the quarter to 9,061 hours; the unit availability for the first three quarters was 54.9%; there were six gas turbine starts, seven bed preheater starts, and six operating periods on coal; during this quarter, total gross generation was 50,416 MWH, the peak unit output for one hour was 59 MWH, and the coal consumption was 26,705 tons; fifteen performance tests were conducted during this quarter. Major activities planned for the next period include: continuation of sorbent utilization tests at various bed levels and sulfur retention values; and operation of the unit at higher loads as the ambient temperatures decline, allowing for higher air flow from the gas turbine compressor. Design and permitting, project support, operations, maintenance, manpower, and cost data are discussed.

14773 (DOE/MC/27229–4002) **Pulsed atmospheric fluidized-bed combustion. Quarterly report, October–December 1994.** Thermochem, Inc., Columbia, MD (United States). Jan 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC27229. Order Number DE95000071. Source: OSTI; NTIS; GPO Dep.

Minor changes were made in the steam/water pressure pipe routing from and to boiler shell, to accommodate the bed module orientation change. The ash silo pad elevation was lowered to match the nearest access road level. Grounding system drawing was revised. Foundation work was completed December 31, 1994.

14774 (DOE/MC/29257–4005) **Advanced Turbine Systems program conceptual design and product development. Quarterly report, February–April 1994.** Allison Engine Co., Indianapolis, IN (United States). Feb 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC29257. Order Number DE95000077. Source: OSTI; NTIS; GPO Dep.

Task 8.5 (active clearance control) was replaced with a test of the 2600F prototype turbine (Task 8.1T). Test 8.1B (Build/Teardown of prototype turbine) was added. Tasks 4 (conversion of gas-fired turbine to coal-fired turbine) and 5 (market study) were kicked off in February. Task 6 (conceptual design) was also initiated. Task 8.1 (advanced cooling technology) now has an approved test plan. Task 8.4 (ultra low NOx combustion technology) has completed the code development and background gathering phase. Task 8.6 (two-phase cooling of turbine vanes) is proceeding well; initial estimates indicate that nearly 2/3 of required cooling flow can be eliminated.

14775 (DOE/MT/92021–9) **Analysis/control of in-bed tube erosion phenomena in the fluidized bed combustion (FBC) system. Technical progress report No. 9, [October 1, 1994–December 31, 1994].** Lee, Seong W. Morgan State Univ., Baltimore, MD (United States). School of Engineering. Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92MT92021. Order Number DE95010473. Source: OSTI; NTIS; GPO Dep.

This technical report summarizes the research work performed and progress achieved during the period of October 1, 1994 to December 31, 1994. The characteristics of anti-erosion remedies and mechanism for in-bed in FBC were discussed to provide the basic design guidelines for anti-erosion devices. One of the anti-erosion remedies currently operate the basic principle of creating a protective stagnant layer of solids to against incoming high velocity of solid particles. This stagnant layer of solid is goal of breaking up the local flow patterns at eroding tube surfaces. This principle is embodied by designing of antierosion studs, pins, fins, and baffles. By attaching a number of studs with a sufficient stud-to-stud distance to avoid the bridging of solid particles, tube wastage can be retarded to prolong the boiler tube life. These devices will be used for the measurement of material wastage in the laboratory-scale FBC.

14776 (DOE/PC/90155–T7) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, April 1992–June 1992.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1992]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-07). Order Number DE95011470. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. During this seventh quarter, the natural gas screening tests were successfully completed with turndown operation from 5.6 to 1.5 MMBtu. Some difficulty due to inadequate mixing at high excess air levels at the low firing rate were experienced and a type V injector was installed and utilized successfully. The pulse combustor tailpipe configuration has been slightly modified. The tailpipe has been changed from multi-pipe (three pipes) to single pipe in order to keep the tailpipe section in high temperature zone by reducing the heat transfer surface. A fluidized bed was designed for mixing and fluidizing coal and limestone to provide a more uniform and continuous feed rate. The fluidized bed will be installed between the Y-connection of the exits of the rotary valves and the venturi eductor.

14777 (DOE/PC/90155–T8) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, July 1992–September 1992.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1992]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-08). Order Number DE95011471. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. During this 8th quarter, shakedown testing on coal for preparation for preliminary system testing was completed. Limestone and coal feed subsystems were calibrated. Some modifications to the injectors and other components were completed and a malfunction of the control system was analyzed and modifications (repairs) accomplished.

14778 (DOE/PC/90155–T9) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, October 1992–December 1992.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1992]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-09). Order Number DE95011472. Source: OSTI; NTIS; GPO Dep.

The overall objective of this Phase III for the Development and Testing of a Commercial-Scale, Coal-Fired Combustion System is to demonstrate and analyze the performance of a fully integrated system at the 5 to 6 MMBtu level to evaluate its potential marketability. The application assumes the availability of both a coal-based fuel and the equipment required to deliver such fuel to a building, store it within the building or in a storage container or tank adjacent to the building, and transport it from storage to the burner. The fuel is delivered and stored either in the form of a coal-water fuel or as a dry powder. During this 9th quarter, preparations for initiating the preliminary systems tests were conducted. Some repairs and modifications to the system were completed and the system went through some initial shakedown testing.

14779 (DOE/PC/90155–T10) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, January 1993–March 1993.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1992]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-10). Order Number DE95011473. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. During this 10th quarter, a series of five shakedown tests were performed after the modifications indicated by the initial set of coal-fired tests were completed. The firing rate of the combustion system utilizing natural gas was gradually ramped up to cure the refractory on the boiler extension section. The pulse combustor operation was stable for a variation in coal firing rate from 1.8 to 7.5 MMBtu/hr, indicating a nominal 4:1 turndown capability. The pressure oscillations were robust and the sound pressure level (SPL) varied from 161 to 178 dB with an increase in firing rate. The wave form was near sinusoidal with very low harmonics. The combustion space-heating system was operated for over 100 hours during this period to acquire system characterization test data.

14780 (DOE/PC/90155–T11) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, April 1993–June 1993.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-11). Order Number DE95011474. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system

controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. The component, system and proof-of-concept test program will be conducted at the MTCI development facility in Baltimore, Maryland. Steady-state tests will be performed to determine combustion efficiency, sulfur capture efficiency, gaseous and particulate emissions, thermal efficiency and turndown ratio of the system as a function of several variables. During this 11th quarter, preliminary system screening tests were initiated and indicated a need to modify the swirler; reduce heat loss from the Morrison tube; and insert additional piping at the entrance to the partition disk to enhance residence time for burnout. Additional test runs were made after the modifications were completed. The tests provided a comparison of performance with and without the addition of sorbent.

14781 (DOE/PC/90155–T12) **Development and testing of commercial-scale, coal-fired combustion systems, Phase 3, Technical progress report, July 1993–September 1993.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-12). Order Number DE95011475. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. During this 12th quarter, preliminary system tests were completed and approval to initiate proof-of-concept (POC) tests was provided. A test plan for the proof-of-concept tests was prepared and provided to the DOE. The first two POC tests planned were conducted after facility modifications were completed. The NO_x emissions were much higher than anticipated. Continued POC testing was therefore deferred until an analysis of the system and any planned modifications to resolve this issue are completed.

14782 (DOE/PC/90155–T14) **Development and testing of commercial-scale, coal-fired combustion systems, Phase 3, January 1994–March 1994.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-14). Order Number DE95011477. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. The component, system and proof-of-concept test program will be conducted at the MTCI development facility in Baltimore, Maryland. Steady-state tests will be performed to determine combustion efficiency, sulfur capture efficiency, gaseous and particulate emissions, thermal efficiency and turndown ratio of the system as a function of several variables. The parameters to be investigated include: firing rate (1 to 5 MMBtu/hr), multiple air staging (different stoichiometries in the primary, secondary and tertiary air addition zones), Ca/S molar ratio (1 to 3), fuel type (natural gas, 3 different coals), and sorbent During this 14th quarter, the modifications to the system were completed and preparations for continuing the proof-of-concept testing were initiated.

14783 (DOE/PC/90155–T15) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, April 1994–June 1994.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-15). Order Number DE95011478. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercialscale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. The component, system and proof-of-concept test program will be conducted at the MTCI development facility in Baltimore, Maryland. Steady-state tests will be performed to determine combustion efficiency, sulfur capture efficiency, gaseous and particulate emissions, thermal efficiency and turndown ratio of the system as a function of several variables. During this 15th quarter, all of the repairs and modifications resulting from the critical testing last period were completed and additional shakedown testing was initiated. After some additional fixes to the feed system to obtain representative ash samples for analysis, a series of tests were conducted to evaluate sulfur capture; NO_x reduction; combustion efficiency and to confirm repeatability.

14784 (DOE/PC/90155–T16) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, July 1994–September 1994.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-16). Order Number DE95011479. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. During this 16th quarter, a series of tests were carried out in preparation for a 48-hour test to collect complete performance data of the unit. These tests indicated that some modifications would be required to improve overall performance. The modifications were completed and the 48-hour test conducted. At this point in time, the unit has acquired over 350 hours of operations at firing rates from 2.6 – 6.7 MMBtu/hr with no fouling of the tubes apparent. NO_xemissions ranged from .2 to .3 lbs/MMBtu, stack particulates were less than .01 lbs/MMBtu and a combustion efficiency greater than 99 percent achieved.

14785 (DOE/PC/90155–T17) **Development and testing of commercial-scale, coal-fired combustion systems: Phase 3, Technical progress report, October 1994–December 1994.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90155. (MTCI–10050-17). Order Number DE95011480. Source: OSTI; NTIS; GPO Dep.

The objective of this Phase III program for the development of a commercial-scale, coal-fired combustion system is to develop and integrate all system components from fuel through total system controls building upon the prior Phase I and II development accomplishments of the MTCI pulse combustion technology and to then field test the complete system in order to evaluate its potential marketability. During this 17th quarter, the Demonstration Test Plan was approved and initial demonstration tests conducted. The results of these initial tests confirmed the performance of the pulse combustion system with the data collected similar to that previously reported, indicating good repeatability.

14786 (DOE/PC/90165–T5) **Utilization of coal-water fuels in fire-tube boilers. Final report, October 1990–August 1994.** Sommer, T.; Melick, T.; Morrison, D. Energy and Environmental Research Corp., Irvine, CA (United States). [1994]. 254p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90165. Order Number DE95007543. Source: OSTI; NTIS; GPO Dep.

The objective of this DOE sponsored project was to successfully fire coal-water slurry in a fire-tube boiler that was designed for oil/gas firing and establish a data base that will be relevant to a large number of existing installations. Firing slurry in a fire-tube configuration is a very demanding application because of the extremely high heat release rates and the correspondingly low furnace volume where combustion can be completed. Recognizing that combustion efficiency is the major obstacle when firing slurry in a

fire-tube boiler, the program was focused on innovative approaches for improving carbon burnout without major modifications to the boiler. The boiler system was successfully designed and operated to fire coal-water slurry for extended periods of time with few slurry related operational problems. The host facility was a 3.8 million Btu/hr Cleaver-Brooks fire-tube boiler located on the University of Alabama Campus. A slurry atomizer was designed that provided outstanding atomization and was not susceptible to pluggage. The boiler was operated for over 1000 hours and 12 shipments of slurry were delivered. The new equipment engineered for the coal-water slurry system consisted of the following: combustion air and slurry heaters; cyclone; baghouse; fly ash reinjection system; new control system; air compressor; CWS/gas burner and gas valve train; and storage tank and slurry handling system.

14787 (DOE/PC/90286–T8) **Combustion fume structure and dynamics. Period of performance: 8/16/91–2/15/92.** Flagan, R.C. California Inst. of Tech., Pasadena, CA (United States). [1992]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90286. Order Number DE95009683. Source: OSTI; NTIS; GPO Dep.

During pulverized coal combustion, a fume of submicron particles is formed when minerals that have volatilized from the parent coal nucleate to form new particles. The particles thus generated are extremely small, but they grow rapidly due to Brownian coagulation. Much has been learned about these fine particles in experimental studies of the particles formed in coal combustion. Measurements of the variation of chemical composition with particle size clearly demonstrate that the particles smaller than about 0.1 μm in diameter are formed from vapors while larger particles are dominated by residues from the mineral matter in the coal. Theoretical predictions of the evolution of the particle size distribution suggest that the nuclei should produce a sharp peak which may approach 0.1 μm, but they are unlikely to grow much beyond that size in the limited time available in practical combustors. The focus of this research program is on elucidating the fundamental processes that determine the particle size distribution, composition, and agglomerate structures of coal ash fumes. The ultimate objective of this work is the development and validation of a model for the dynamics of combustion fumes, describing both the evolution of the particle size distribution and the particle morphology. The study employs model systems to address the fundamental questions and to provide rigorous validation of the models to be developed. This first phase of the project has been devoted to the development of a detailed experimental strategy that will allow agglomerates with a broad range of fractal dimensions to be studied in the laboratory.

14788 (DOE/PC/91292–T13) **Rheological properties essential for the atomization of Coal Water Slurries (CWS). Quarterly progress report, September 15, 1994–December 15, 1994.** Ohene, F. Grambling State Univ., LA (United States). Dept. of Chemistry. [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91292. Order Number DE95009344. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to perform experiments to understand the effect of high shear and extensional properties on the atomization of coal-water slurries (CWS). In the atomization studies, the mean drop size of the CWS sprays will be determined at various air-to-CWS. A correlation between the extensional and high shear properties, particle size distributions and the atomization will be made in order to determine the influence of these parameters on the atomization of CWS.

14789 (DOE/PC/94203–T1) **Interactions between trace metals, sodium and sorbents in combustion. Quarterly report No. 1, October 1, 1994–December 31, 1994.** Wendt, J.O.L. Arizona Univ., Tucson, AZ (United States). Dept. of Chemical Engineering. 22 Feb 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94203. Order Number DE95010631. Source: OSTI; NTIS; GPO Dep.

The proposed research is directed at an understanding of how to exploit interactions between sodium, toxic metals and sorbents, in order to optimize sorbents injection procedures, which can be used to capture and transform these metals into environmentally benign forms. The research will use a 17kW downflow, laboratory combustor, to yield data that can be interpreted in terms of fundamental kinetic mechanisms. Metals to be considered are lead, cadmium, and arsenic. Sorbents will be kaolinite, bauxite, and limestone. The role of sulfur will also be determined. The research is divided into five tasks: Task 1, combustor modifications; Task 2, screening experiments; Task 3, mechanisms; Tasks 4, applications; and Task 5, mathematical modelling. Work on this research grant has commenced, with efforts on Task 1 (Combustor Modifications) and on Task 5 (Mathematical Modelling).

0150 Economic, Industrial, and Business Aspects

Refer also to citation(s) 14769, 14770, 15704

14790 (DOE/EIA–0543(94/4Q)) **U.S. energy industry financial developments: 1994 Fourth quarter.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. Apr 1995. 21p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010321. Source: OSTI; NTIS; GPO; GPO Dep.

This report traces key developments in US energy companies' financial performance for the fourth quarter of 1994. Financial data (only available for publicly-traded US companies) are included in two broad groups–fossil fuel production and rate-regulated utilities. All financial data are taken from public sources such as corporate reports and press releases, energy trade publications, and The Wall Street Journal's Earnings Digest. Return on equity is calculated from data available from Standard and Poor's Compustat data service. Since several major petroleum companies disclose their income by lines of business and geographic area, these data are also presented in this report. Although the disaggregated income concept varies by company and is not strictly comparable to corporate income, relative movements in income by lines of business and geographic area are summarized as useful indicators of short-term changes in the underlying profitability of these operations. 6 figs, 5 tabs.

14791 (DOE/EIA–M060(95)) **Model documentation coal market module of the National Energy Modeling System.** USDOE Energy Information Administration, Washington, DC (United States). Energy Supply and Conversion Div. Mar 1995. 198p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010094. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the approaches used in developing the Annual Energy Outlook 1995 (AEO95). This report catalogues and describes the assumptions, methodology, estimation techniques, and source code of the coal market module's three submodules. These are the Coal Production Submodule (CPS), the Coal Export Submodule (CES), the Coal Expert Submodule (CES), and the Coal Distribution Submodule (CDS).

14792 (ETDE-DE–71) **Coal mining in the power industry of the Federal Republic of Germany in 1992.** Statistik der Kohlenwirtschaft e.V., Essen (Germany). Nov 1993. 95p. (In German). Order Number DE95769851. Source: OSTI; NTIS (US Sales Only).

After an introductory text divided into the sections energy and coal market, coal mining and brown coal mining, extensive tables containing the most important characteristic figures of German coal mining are shown. (orig.)

14793 (INIS-mf–14492) **On possibility for creation of residue-free TPP on solid fuel with high ecological and energetic characteristics.** Madoyan, A.A.; D'yakov, A.F.; Arakelyan, Eh.K.; Baltyan, V.N.; Minasyan, S.A. AN SSSR, Moscow (Russian Federation). 1994. 4p. (In Russian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627070. Source: OSTI; NTIS (US Sales Only); INIS.

The authors describe a new direction of efficient coal gasification in aerohydroslag melt that offers low emissions of SO_2, NO_2 and particulates even in large-scale facilities as well as conversion of residues in saleable byproducts. The new technology is developed at the Nesvetaj GRES pilot plant (RU). The gasification is carried out in turbulent mixed emulsion of fuel and liquid slag (heat carrier). Vapour-oxygen gas is introduced under excess pressure into slag melt and creates gas-saturated layer of heterogenous melt consisting of coal slag and lime. As a result in-depth coal separation and

gasification takes place. The NO_x emissions from the melt are reduced to 40-60 mg/nm^3, and after reheating (combustion chamber) - to 100-150 mg/nm^3. The sulfur oxides emissions are reduced to 25-50%. The degree of coal-derived ash capture in the slag melt reaches the record value of 99.5%. The light slag from the top of the melt is utilised for building materials, and the heavy polymetallic slag is processed in metallurgy. Besides having the positive environmental benefit of meeting the stringent ecological requirements, the proposed system has high technological efficiency. (orig.).

14794 (INIS-mf–14493) **Methodological approach for evaluating the economical and ecological-economical efficiency of estimation of environmental damages caused by thermal plants.** Manoilova, T.; Sirakov, E.; Popsavov, L.; Tsaleva, E.; Khristov, Kh. Energoproekt, Sofia (Bulgaria). 1994. 9p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627071. Source: OSTI; NTIS (US Sales Only); INIS.

A methodology is proposed for assessment of economical and environmental efficiency of thermal power plants. It is based on balance principle taking into account the balance of row materials and energy expressed by quantitatively comparable criteria. The main criteria for evaluation of damages caused by TPP is the generally accepted factor of overall efficiency. The assessment obtained are complex and easy-to-implement as the balances are expressed in financial and energetic equivalents. The methodology is supported by a computer program. The expenses for environmental protection and compensation of losses are included in the capital expenditures. The importance of human factor related expenses is stressed also. The minimal overall expenditures at maximal overall efficiency correspond to an optimal variant of stable production. The proposed methodology is universal and could be applied in different industrial systems. Its application is illustrated on the example of the Maritsa-Iztok TPP, Dimitrovgrad (BG). 5 figs. (orig.).

14795 (LA-UR–95-624) **An evaluation of commercialization mechanisms for the Clean Coal Technology Program.** Joyce, E.L. Jr.; Matysiak, L.M.; Wampler, J.A. Los Alamos National Lab., NM (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007856. Source: OSTI; NTIS; GPO Dep.

The Clean Coal Technology (CCT) Program is an exemplary model of a successful collaboration between industry and government to develop advanced clean coal technologies that will both sustain and expand coal usage for electrical power production and materials manufacturing. Begun in 1985, the program has included five national competitive solicitations over a period of nine years. These solicitations have resulted in forty-five projects covering twenty-one states with a total capital investment of almost $7 billion. The goal of the program has been to demonstrate the next generation of advanced coal based technologies and to transfer these technologies to individual companies in the domestic and international market place. This study was commissioned by the CCT Program to evaluate technology transfer mechanisms used in other programs that can be used to stimulate the commercialization of the CCT Program's technologies. Los Alamos National Laboratory (LANL) was selected for this task because of its involvement in the Natural Gas and Oil Technology Partnership, which is sponsored by the DOE Office of Fossil Energy. The mission of the Partnership is to coordinate the development and transfer of technologies developed at DOE national laboratories to the U.S. petroleum industry. The intent of this study is to examine the structure of the Partnership and evaluate the applicability of this structure to the CCT Program.

14796 (NEDO-C–9329) **Feasibility survey of the environmental harmony type coal utilization system. Case in Indonesia.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Jun 1994. 206p. (In Japanese). Order Number DE95769803. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A survey was made on the coal utilization system in terms of environmental policies and improvement of efficiency in coal utilization in Indonesia. There are now three coal-fired power plants run by the governmental electric power corporation in Indonesia, PLN. A total power generation capacity of the three plants is 2.53 million kW, all of which are from combustion of pulverized coal. A special feature is that the design of flue gas treatment facilities is simple, only electrostatic precipitator, on condition that high volatile matter and low sulfur (0.3-0.5%) coal in Indonesia is used. As capacity of power plants increases hereafter, it seems to be needed to take measures against emissions of SOx and NOx and highly increase efficiency. In addition, there are presently problems on dust collectability and scattering of fly ash, and measures for solution to these problems are needed. Cement plants are comparatively new and have positively promoted reconstruction of the equipment for energy conservation. Also they are high in energy efficiency and are tackling the problem on the dust. Therefore, the cement industry is full in activity for solution to the environmental problem. It is needed to produce smokeless and odorless private-use briquette and establish combustion technology. 49 figs., 64 tabs.

0170 Legislation and Regulations

Refer also to citation(s) 15707

02 PETROLEUM

14797 (DOE/BC–95/5/SP) **Oil program implementation plan FY 1996–2000.** USDOE Bartlesville Project Office, OK (United States). Apr 1995. 150p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95000139. Source: OSTI; NTIS; GPO Dep.

This document reaffirms the US Department of Energy (DOE) Office of Fossil Energy commitment to implement the National Oil Research Program in a way to maximize assurance of energy security, economic growth, environmental protection, jobs, improved economic competitiveness, and improved US balance of trade. There are two sections and an appendix in this document. Section 1 is background information that guided its formulation and a summary of the Oil Program Implementation Plan. This summary includes mission statements, major program drivers, oil issues and trends, budget issues, customers/stakeholders, technology transfer, measures of program effectiveness, and benefits. Section 2 contains more detailed program descriptions for the eight technical areas and the NIPER infrastructure. The eight technical areas are reservoir characterization; extraction research; exploration, drilling, and risk-based decision management; analysis and planning; technology transfer; field demonstration projects; oil downstream operations; and environmental research. Each description contains an overview of the program, descriptions on main areas, a discussion of stakeholders, impacts, planned budget projections, projected schedules with Gantt charts, and measures of effectiveness. The appendix is a summary of comments from industry on an earlier draft of the plan. Although changes were made in response to the comments, many of the suggestions will be used as guidance for the FY 1997–2001 plan.

0202 Reserves, Geology, and Exploration

Refer also to citation(s) 14824, 14826, 14829, 14833, 14852, 16715, 16716, 16717, 16718, 16719, 16720, 16721, 16722, 16728

14798 (DOE/BC/14891–5) **Interdisciplinary study of reservoir compartments. Quarterly technical progress report, October 1, 1994–December 31, 1994.** Van Kirk, C.W. Colorado School of Mines, Golden, CO (United States). Dept. of Petroleum Engineering. 27 Jan 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14891. Order Number DE95010464. Source: OSTI; NTIS; GPO Dep.

This DOE research project was established to document the integrated team approach for solving reservoir engineering problems. A field study integrating the disciplines of geology, geophysics, and petroleum engineering will be the mechanism for documenting the integrated approach. This is an area of keen interest to the oil and gas industry. The goal will be to provide tools and approaches that

can be used to detect reservoir compartments, reach a better reserve estimate, and improve profits early in the life of a field. Brief summaries are provided for the following six tasks: reservoir selection and data gathering; outcrop/core/log analysis/and correlations; internal architecture description; seismic analysis; detailed reservoir engineering evaluation; and permeability experimental work. Where appropriate reports by the research professors and the research assistants are included in the appendix.

14799 (DOE/BC/14894–6) **Application of artificial intelligence to reservoir characterization: An interdisciplinary approach. Quarterly report, October 1–December 31, 1994.** Tulsa Univ., OK (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14894. Order Number DE95010480. Source: OSTI; NTIS; GPO Dep.

This basis of this research is to apply novel techniques from Artificial Intelligence and Expert Systems in capturing, integrating and articulating key knowledge from geology, geostatistics, and petroleum engineering to develop accurate descriptions of petroleum reservoirs. The main challenge of the proposed research is to automate the generation of detailed reservoir descriptions honoring all the available soft and hard data that ranges from qualitative and semi-quantitative geological interpretations to numeric data obtained from cores, well tests, well logs and production statistics. In this sense, the proposed research project is truly multidisciplinary. Additional challenges are the verification and validation of the expert system, since much of the interpretation of the experts is based on extended experience in reservoir characterization. The overall project plan to design the system to create integrated reservoir descriptions begins by initially developing an AI-based methodology for producing large-scale reservoir descriptions generated interactively from geology and well test data. Parallel to this task is a second task that develops an AI-based methodology that uses facies-biased information to generate small-scale descriptions of reservoir properties such as permeability and porosity. The third task involves consolidation and integration of the large-scale and small-scale methodologies to produce reservoir descriptions honoring all the available data. The final task will be technology transfer. With this plan, the authors have carefully allocated and sequenced the activities involved in each of the tasks to promote concurrent progress towards the research objectives. The results of the integration are not merely limited to obtaining better characterizations of individual reservoirs. They have the potential to significantly impact and advance the discipline of reservoir characterization itself.

14800 (DOE/BC/14970–2-Rev.) **Gypsy Field Project in reservoir characterization. Revision, Second quarterly report, [October 1, 1994–December 31, 1994].** Meara, D.J. Jr. Oklahoma Univ., Norman, OK (United States). Center for Reservoir Characterization. 22 Mar 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94BC14970. Order Number DE95010786. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to use the extensive Gypsy Field laboratory and data set as a focus for developing and testing reservoir characterization methods that are targeted at improved recovery of conventional oil. The Gypsy Field laboratory consists of coupled outcrop and subsurface sites which have been characterized to a degree of detail not possible in a production operation. Data from these sites entail geological descriptions. core measurements, well logs, vertical seismic surveys, a 3D seismic survey, crosswell seismic surveys, and pressure transient well tests. The overall project consists of four interdisciplinary sub-projects which are closely interlinked: (1) modeling depositional environments; (2) sweep efficiency; (3) tracer testing; and (4) integrated 3D seismic interpretation. The first of these aims at improving our ability to model complex depositional environments which trap movable oil. The second is a development geophysics project which proposes to improve the quality of reservoir geological models through better use of 3D seismic data. The third investigates the usefulness of a new numerical technique for identifying unswept oil through rapid calculation of sweep efficiency in large reservoir models. The fourth explores what can be learned from tracer tests in complex depositional environments, particularly those which are fluvial dominated. During this quarter, the main activities involved the Integrated 3-D Seismic Interpretation project, for which the progress is reported.

14801 (DOE/BC/14982–1) **An integrated study of the Grayburg/San Andres reservoir, Foster and South Cowden fields, Ector County, Texas. Quarterly technical progress report number 1, August 2–October 30, 1994.** Reeves, J.J.; Rowland, D.A.; Trentham, R.C. Laguna Petroleum Corp., Midland, TX (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94BC14982. Order Number DE95010482. Source: OSTI; NTIS; GPO Dep.

The objective of this study is to demonstrate a methodology for reservoir characterization of shallow shelf carbonate reservoirs which is feasible for the independent operator. Furthermore, it will provide one of the first public demonstrations of the enhancement of reservoir characterization using high resolution 3D seismic data. This particular project will evaluate the Grayburg and San Andres reservoirs in the Foster and South Cowden Fields of Ector County, Texas. The authors intend to showcase a multi-disciplinary approach to water flood design and implementation, along with the addition of reserves by selective infill drilling. They believe this approach in reservoir development will be applicable to a wide range of shallow shelf carbonate reservoirs throughout the US. During the month of August, 1994, the 3D seismic survey over the project area was shot by Dawson Geophysical. To date, the data is still being processed at Dawson Geophysical. Technology transfer will take place through all phases of the project.

14802 (DOE/ER/13412–T1) **A study of the source material, and mechanisms of generation, and migration of oils in the Anadarko Basin, Oklahoma. Progress report, September 1, 1986–August 31, 1987.** Philp, R.P. Oklahoma Univ., Norman, OK (United States). [1995]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-85ER13412. Order Number DE95010168. Source: OSTI; NTIS; GPO Dep.

After the first year, when personnel and equipment were consolidated, the second year can be characterized by major advances in the various research areas falling within the project. In August and September of last year we moved into the newly completed Energy Center. This resulted in a dramatic increase in the laboratory space available to the group and allowed us to site our major research instruments in rooms conducive to good analytical practices. The two new mass spectrometer systems (isotope and triple stage quadrupole), alluded to in the previous report, arrived and were installed in December 1986 and January 1987, respectively. Since their installation they have both been working satisfactorily, with the minimum of downtime. The original description of this project was relatively broad, allowing more specialized areas to be investigated in detail, as they became evident. A number of areas of particular interest have now emerged. These include: (i) An oil-oil and oil-source rock correlation study of the Pauls Valley area, Garvin and Murray Counties, Oklahoma; (ii) A study of the effect of biodegradation on the bitumen of a tar sand, South Woodford area, Carter County, Oklahoma; and (iii) An organic geochemical survey of the Woodford Shale in the Anadarko Basin and surrounding areas. Whilst these specialized areas have consumed much of our effort, the broader scale study has also been advanced. Some of this work has been presented at national meetings. The remainder of this report details the samples available to us, at the present time, and discusses some of the major results of the various study areas mentioned above.

14803 (NEI-DK–1911) **Introduction to the project and a summary of the results.** Heilmann-Clausen, C.; Michelsen, O. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 42p. (In Danish). Contract ENS-1313/92-0003. Order Number DE95766537. Source: OSTI; NTIS.

EFP-92.

The report comprises an introduction to the project entitled 'Tertiaer bassinudvikling i Central Truget med saerlig vaegt paa mulige reservoirforekomster' (Basin development of the Tertiary of the Central Trough with emphasis on possible hydrocarbon reservoirs) and summarizes the results of the reports nos. 2-27 which have been produced in connection with the project. The overall aim of the project was, on the basis of a detailed sequence-stratigraphic

analysis, to identify periods dominated by sand-depositing within the palaeographic facies-distribution throughout that period. Another aim was to improve possibilities for localizing Tertiary bodies of sand which could be potential reservoirs of hydrocarbons and also to contribute to the possibilities for improving the modelling of basins with regard to hydrocarbon formation and accumulation. Regions dealt with are the North sea and coastal and land areas in Denmark. (AB)

14804 (NEI-DK–1918) **Seismic stratigraphy and foraminiferal biofacies in a profile into the Central Trough, North Sea.** Konradi, P.B.; Laursen, G.V.; Bidstrup, T. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 45p. Contract ENS-1313/92-0003. Order Number DE95766544. Source: OSTI; NTIS.

EFP-92.

Cutting samples from the exploration wells, Cleo-1, Mona-1 and Kim-1, in the Central Trough area in the northwestern part of the Danish North Sea, have been investigated for their foraminiferal content in the section above the prominent mid-Miocene marker. Benthonic foraminifers have been used to produce a stratigraphic subdivision by reference to the standard North Sea zonating of King. The North Sea Benthonic zones (NAB zones) 11 to 17 (Middle Miocene to Middle Pleistocene) have been identified above the event. The palaeoenvironmental indications of the zones are interpreted in each borehole. These results are compared to the seismostratigraphic framework of seismic profiles connecting the boreholes. Palaeoenvironmental reconstruction shows that generally sediments from the investigated interval from Cleo-1 were deposited in a shallower situation than equivalent deposits in Mona-1, and these again shallower than at Kim-1 and that the depocenter was changing through time as it prograded out into the basin. A conspicuous hiatus is identified in Cleo-1 and Mona-1 at the Pliocene-Pleistocene boundary. The seismic interpretation support the environmental interpretation of the bentihic fauna. (au) (20 refs.)

14805 (NEI-DK–1919) **Late Cenozoic sequences in the Southern North Sea Basin.** Soerensen, J.C.; Olaf Michelsen. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 44p. Contract ENS-1313/92-0003. Order Number DE95766545. Source: OSTI; NTIS.

EFP-92.

The late Cenozoic deposits, which cover the 'Mid-Miocene Unconformity' in the Danish, German and Dutch North Sea sectors, are subdivided into thirty-one sequences. An progradation from the east to the west is observed. Most of the sequences can be subdivided into systems tracts. Lowstand systems tracts often appear seismically as prograding wedges. In areas where high-angled progradation dominates the stratal pattern, the upper boundary of the lowstand systems tract is recognised as a prominent toplap surface. This unconformity is suggested as a bypass zone formed during lowstand progradation. The maximum flooding surface and the condensed section are identified as a maximum gamma ray peak, which separates an upward fining trend below the peak from an upward coarsening trend above. The two trends represent the transgressive and the highstand systems tracts, respectively. Sequence boundaries are often associated with widespread erosional troughs, extending in a direction perpendicular to the dominant direction of sediment transport. The erosion may have been caused by coastal parallel marine currents. The accumulation rates of the sediments seem to have culminated during periods with decreasing palaeo-temperatures. During a relatively stable and cold period, the sequences were deposited as prograding wedges with a limited lateral extension. Two periods of maximum palaeo-temperature are time equivalent with two distinct condensed intervals. The Ringkoebing-Fyn High seems to have influenced the regional distribution of the late Cenozoic sequences, and the sediment accumulation was mainly concentrated in the former Mesozoic basinal areas around the high. (au) (30 refs.)

14806 (NEI-DK–1922) **Palaeocene/Eocene diatomite in wells in the eastern North Sea.** Danielsen, M.; Thomsen, E. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 19p. Contract ENS-1313/92-0003. Order Number DE95766528. Source: OSTI; NTIS.

EFP-92.

Diatomite referred to the Palaeocene/Eocene boundary interval is described from wells in the eastern North Sea. The diatomite is rather similar to the diatomaceous Fur Formation in northwestern Jutland. Investigations of cuttings samples and log patterns in wells from the Norwegian sector indicate that the diatomite is stretching from the coast of Jutland towards the northwest along the southern coast of Norway, thus forming a natural continuation of the onshore deposit. (au) (16 refs.)

14807 (NEI-DK–1923) **A Mid-Miocene progradational, sandy barrier island and backbarrier section, central Jylland, Denmark.** Nielsen, S.A.V.; Nielsen, L.H. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 20p. Contract ENS-1313/92-0003. Order Number DE95766529. Source: OSTI; NTIS.

EFP-92.

This paper reports on a c. 15 m thick section of marine, coastal sand, that combine a hitherto less described facies succession transitional to the Miocene fluvio-deltaic and open marine deposits. The section is exposed in a pit located 10 km northeast of the sandy fluvio-deltaic brown coal bearing strata of the Soeby-Fasterholt area, known as the Odderup formation (Middle Miocene). The section comprises more than 6 m of trough cross-stratified, low-angle cross-stratified and parallel-laminated, sand and gravel, deposited on the foreshore and backshore of a barrier island. Locally these deposits are eroded by a steep-sided washover channel with a sandy fill. The overlying back-barrier deposits re up to 9 m thick, and are initiated by a thin bituminous mud bed with a mixture of terrigeneous and marine organic matter. Above, a series of 0.2-2 m thick beds of tangential to sigmoidal cross-stratified sand, often with well preserved topset, are deposited. These beds are interbedded with ripple-laminated and parallel-laminated sand. Burrows of Ophiomorpha, possibly Skolithos and Arenicolithes occur in the back-barrier deposits and in the top of the washover channel-fill. The succession of well-preserved coastal facies-belts indicates that the depositional area was characterized by a large sediment supply in combination with a rising sea-level. The section was probably formed fairly rapidly during a coastal progradation more or less contemporaneously with the general transgression that led to the deposition of the brackish-marine Hodde Formation and later the fully marine Gram Formation. (au) (14 refs.)

14808 (NEI-NO–507) **Exploration challenges: A global view.** Smith, H.A. Norsk Petroleumsforening, Oslo (Norway). 1994. 28p. (CONF-9408229–14: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766583. Source: OSTI; NTIS.

The conference paper gives a global view on offshore exploration challenges. Besides the many aspects discussed in this paper, the conclusion is to keep searching for new and better ways to rapidly adapt to the changing business environment, create the technology innovations to be searched for, and nurture the scientific creativity. According to the author, the alignment of technology with business needs, and capitalization on the strength of human resources are the keys to survival. Through this integration there is to be enhanced understanding of the petroleum system, shortening the exploration cycle time and cost reduction of finding. Technology and partnerships will improve the economics of the business, ultimately lead to new and varied opportunities. 15 figs.

14809 (NEI-NO–508) **Exploration challenges. A North Sea/Norwegian Sea perspective.** Nese, K. (Statoil (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 29p. (CONF-9408229–15: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766584. Source: OSTI; NTIS.

The conference paper deals with the Norwegian challenges offshore. In general, there is a move from large to small finds, from giant developments to development of marginal fields. The income from producing fields is declining rapidly in the years to come, and there is an increasing urge to realize early income from future prospects to maintain cash flow. Improved business opportunities within the oil and gas industry are to be realized requiring closer

collaboration between the actors in the industry and the authorities. These constructive processes are in progress in Norway. 21 figs.

14810 (NEI-NO–509) **Cost-effective technology levers to improve exploration and production efficiency.** Monti, R. Norsk Petroleumsforening, Oslo (Norway). 1994. 7p. (CONF-9408229–16: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766585. Source: OSTI; NTIS.

The conference paper deals with a vital goal for improving offshore exploration and production efficiency by cost-effective technology in slimhole drilling. The paper discusses the different instruments and tools designed for such applications. The most exciting developments are coiled-tubing drilling (CTD) combining the virtues of a small rig with some unique operational advantages. Experience has already shown that in the right circumstances drilling costs may be slashed using CTD. Drilling with coiled tubing is still developing, logging technology is being extended to deliver slimhole images equivalent to those from conventional wells, and smaller diameter testing is under trial and nearly ready for widespread use.

14811 (NEI-NO–510) **New seismic technology.** Ziolkowski, A. (Edinburgh Univ. (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 27p. (CONF-9408229–17: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766586. Source: OSTI; NTIS.

The conference paper aims to show that new seismic technology is becoming available to meet current challenges by using three-dimensional (3D) seismic data acquisition and processing. According to the author, it is often cost-effective to search for the structures using 3D methods from the start for three reasons: Firstly, because a more precise image is obtained at a much earlier stage in exploration; secondly, because 3D methods can sometimes reveal structures that are invisible to 2D methods; thirdly, the cost of acquisition, processing and interpretation of precise 3D data have been reduced considerably. Fast, accurate automatic imaging of structures by pre-stack depth migration is now realisable with new algorithms being developed, and the technology to acquire and process 3D data for rapid imaging of submarine geological structures is available. 7 figs.

14812 (NEI-NO–511) **What can a reservoir engineer expect from production geophysics. Now and in the future.** Beydoun, W. (Elf Geoscience Research Centre, London (United Kingdom)); Robein, E. Norsk Petroleumsforening, Oslo (Norway). 1994. 17p. (CONF-9408229–18: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766587. Source: OSTI; NTIS.

The conference paper deals with offshore seismic methods for analysing production geophysics. Firstly, the authors recall what information about the earth interior a seismic experiment can provide, and there are deduced what the reservoir model and the seismic data should ideally have in common and what is actually achieved in practice. Next the authors consider the actual usage of seismics in the building of a reservoir model, and what more advanced technique can offer at present and in future. The possibly and limits of reservoir monitoring by seismics are assessed. 38 refs., 2 figs.

14813 (NEI-NO–512) **Reservoir geophysics, today and tomorrow.** Walker, C. (PGS Exploration, Walton-on-Thames (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 19p. (CONF-9408229–19: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766588. Source: OSTI; NTIS.

The conference paper deals with geophysical techniques and methods for improving hydrocarbon recovery. The paper illustrates the collection of S-wave data. The complex relationship between porosity and permeability means that there is no unique link from seismic data to permeability, but 3D seismic data, well logs and core information can provide descriptions of the reservoir. By marrying the areal information derived from 3D seismic, VSP and cross well tomography with lithological and petrophysical data obtained from well logs and cores, the mapping capabilities can be extended to encompass reservoir rock propitious which are not directly discernible from the seismic data itself. By combining reservoir description data with fluid movement information derived from time lapse 3D integrated with reservoir engineering data, the reservoir can be monitored. 30 refs., 3 figs.

14814 (NEI-NO–518) **Azerbaijan: Cooperation and challenge.** Adams, T.D. (BP Exploration Co. (Azerbaijan)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–25: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766594. Source: OSTI; NTIS.

With the break up of the former Soviet Union, access to the oil rich basins of the Greater Caspian created unexpected options for new investments by the West. Baku, as a regional operating centre, has been producing oil since the 1870's, with an established infrastructure for both on and offshore oil development. Caspian offshore fields are restricted to relatively shallow waters, and much of the area remains unexplored or undeveloped. According to the author of this paper, there is a unique demand of regional cooperation. Unless a pipeline route to the west is successfully agreed in terms of route and finance, significant investments in Caspian will be delayed.

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Refer also to citation(s) 14798, 14800, 14801

14815 (DOE/BC–95/3/SP) **Supporting technology for enhanced oil recovery - EOR thermal processes.** USDOE Bartlesville Project Office, OK (United States). Mar 1995. 269p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95000137. Source: OSTI; NTIS; GPO Dep.

This report contains the results of efforts under the six tasks of the Eighth Amendment and Extension of Annex IV, Enhanced Oil Recovery Thermal Processes of the Venezuela/USA Agreement. The report is presented in sections and each section contains one or more reports prepared by various individuals or groups describing the results of efforts under each of the tasks. A statement of each task, taken from the agreement, is presented on the first page of each section.

14816 (DOE/BC–14661-10) **Oil recovery from naturally fractured reservoirs by steam injection methods. Final report.** Reis, J.C.; Miller, M.A. Texas Univ., Austin, TX (United States). Center for Petroleum and Geosystems Engineering. May 1995. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90BC14661. Order Number DE95000140. Source: OSTI; NTIS; GPO Dep.

Oil recovery by steam injection is a proven, successful technology for nonfractured reservoirs, but has received only limited study for fractured reservoirs. Preliminary studies suggest recovery efficiencies in fractured reservoirs may be increased by as much as 50% with the application of steam relative to that of low temperature processes. The key mechanisms enhancing oil production at high temperature are the differential thermal expansion between oil and the pore volume, and the generation of gases within matrix blocks. Other mechanisms may also contribute to increased production. These mechanisms are relatively independent of oil gravity, making steam injection into naturally fractured reservoirs equally attractive to light and heavy oil deposits. The objectives of this research program are to quantify the amount of oil expelled by these recovery mechanisms and to develop a numerical model for predicting oil recovery in naturally fractured reservoirs during steam injection. The experimental study consists of constructing and operating several apparatuses to isolate each of these mechanisms. The first measures thermal expansion and capillary imbibition rates at relatively low temperature, but for various lithologies and matrix block shapes. The second apparatus measures the same parameters, but at high temperatures and for only one shape. A third experimental apparatus measures the maximum gas saturations that could build up within a matrix block. A fourth apparatus measures thermal conductivity and diffusivity of porous media. The numerical study consists of developing transfer functions for oil expulsion from matrix blocks to fractures at high temperatures and incorporating them, along with the energy equation, into a dual

porosity thermal reservoir simulator. This simulator can be utilized to make predictions for steam injection processes in naturally-fractured reservoirs. Analytical models for capillary imbibition have also been developed.

14817 (DOE/BC/14831–13) **Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico. Quarterly status report (final), October 1–December 31, 1994.** Schenewerk, P.A. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering. [1995]. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14831. Order Number DE95010481. Source: OSTI; NTIS; GPO Dep.

Much of the remaining oil offshore is trapped in formations that are extremely complex due to intrusion of salt domes. Conventional seismic processing techniques cannot clearly image either of these traps or the full extent of oil-bearing segments near the salt domes; therefore, substantial volumes of oil may have remained uncontacted by previous drilling. However, significant advances in seismic survey image processing have been made which when coupled with directional drilling technology, will allow better recovery prior to abandonment. Progress continues for reducing the data to fit a simplified model and redescribing the resource to accommodate known production behavior and certain geologic assumptions. Write-ups on the critical process parameter laboratory experiments in the form of a master's thesis have been completed. In addition, final reports are currently being prepared. The thrust of this progress report is the submittal of this master's thesis dealing with attic oil recovery by gas injection. This was a bench-scale experiment using a water and oilflooded sand pack to help develop a numerical simulation which would adequately predict optimal gas injection rates and expected recovery. The paper reviews the effect of soak time, slug size, dip angles, and injection schemes on the oil recovery.

14818 (DOE/BC/14831–14) **Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico.** Schenewerk, P.A. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering. 17 Mar 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14831. Order Number DE95010778. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to assist in the recovery of non-contacted oil from known reservoirs on the Outer Continental Shelf in the Gulf of Mexico. Mature offshore reservoirs, declining oil reserves, declining production, and other natural forces currently are accelerating the abandonment of offshore oil resources and production platforms. Significant quantities of this oil could be recovered using advanced technologies now available if the resource can be identified. During the past year, a report on the simulation work performed on the U-8 reservoir was completed in the form of a master's thesis.

14819 (DOE/BC/14852–9) **Scale-up of miscible flood processes for heterogeneous reservoirs. Quarterly report, July 1, 1994–September 30, 1994.** Orr, F.M. Jr. Stanford Univ., CA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92BC14852. Order Number DE95010779. Source: OSTI; NTIS; GPO Dep.

The current project is a systematic research effort aimed at quantifying relationships between process mechanisms that can lead to improved recovery from gas injection processes performed in heterogeneous Class I and Class II reservoirs. It will provide a rational basis for the design of displacement processes that take advantage of crossflow due to capillary, gravity and viscous forces to offset partially the adverse effects of heterogeneity. In effect, the high permeability zones are used to deliver fluid by crossflow to zones that would otherwise be flooded only very slowly. Thus, the research effort is divided into five areas: development of miscibility in multicomponent systems; design estimates for nearly miscible displacements; design of miscible floods for fractured reservoirs; compositional flow visualization experiments; and simulation of near-miscible flow in heterogeneous systems. The status of the research effort in each area is reviewed briefly.

14820 (DOE/BC/14852–11) **Scale-up miscible flood processes for heterogeneous reservoirs. Quarterly report, 1 October–31 December 1994.** Orr, F.M. Jr. Stanford Univ., CA (United States). Dept. of Petroleum Engineering. Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92BC14852. Order Number DE95010780. Source: OSTI; NTIS; GPO Dep.

The current project is a systematic research effort aimed at quantifying relationships between process mechanisms that can lead to improved recovery from gas injection processes performed in heterogeneous Class 1 and Class 2 reservoirs. It will provide a rational basis for the design of displacement processes that take advantage of cross flow due to capillary, gravity-and viscous forces to offset partially the adverse effects of heterogeneity. In effect, the high permeability zones are used to deliver fluid by crossflow to zones that would otherwise be flooded only very slowly. Thus, the research effort is divided into five areas: development of miscibility in multicomponent systems design estimates for nearly miscible displacements design of miscible floods for fractured reservoirs compositional flow visualization experiments; and simulation of near-miscible flow in heterogeneous systems. The status of the research effort in each area is reported briefly in the following section.

14821 (DOE/BC/14882–11) **Responsive copolymers for enhanced petroleum recovery. Quarterly technical progress report, September 11, 1994–December 22, 1994.** McCormick, C.; Hester, R. University of Southern Mississippi, Hattiesburg, MS (United States). Dept. of Polymer Science. [1994]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14882. Order Number DE95010475. Source: OSTI; NTIS; GPO Dep.

Advanced polymer systems that possess microstructural features that are responsive to temperature, electrolyte concentration, and shear conditions are being synthesized which will be superior to polymers presently used for mobility control in enhanced oil recovery. Improved polymer performance is accomplished by controlling hydrophobic or ampholytic interations between individual polymer chains in solution. The advanced polymers will circumbent major problems inherent in conventional EOR polymers in which molecular weight is usually compromised to allow sufficient solution viscosity and uniform reservoir permeation without plugging the porous media. Accomplishments are reported for the following tasks: quaternary ammonium cyclopolymer synthesis; characterization of molecular structure and solution behavior; ^{23}Na NMR studies of non-binding to anionic polyelectrolytes and solution rheology.

14822 (DOE/BC/14886–9) **Investigation of oil recovery improvement by coupling an interfacial tension agent and a mobility control agent in light oil reservoirs Second annual report, October 1993–September 1994.** Pitts, M.J. Surtek, Inc., Golden, CO (United States). Apr 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14886. Order Number DE95000138. Source: OSTI; NTIS; GPO Dep.

"Investigation of Oil Recovery Improvement by Coupling an Interfacial Tension Agent and a Mobility Control Agent in Light Oil Reservoirs" is studying two major areas concerning co-injecting an interfacial tension reduction agent(s) and a mobility control agent. The first area defines the interactions of alkaline agents, surfactants, and polymers on a fluid-fluid and a fluid-rock basis. The second area concerns the economic improvement of the combined technology. This report continues the fluid-fluid interaction evaluations and begins the fluid-rock studies. Fluid-fluid interfacial tension work determined that replacing sodium ion with either potassium or ammonium ion in solutions with interfacial tension reduction up to 19,600 fold was detrimental and had little or no effect on alkali-surfactant solutions with interfacial tension reduction of 100 to 200 fold. Reservoir brine increases interfacial tension between crude oil and alkaline-surfactant solutions. Na_2CO_3-surfactant solutions maintained ultra low and low interfacial tension values better than NaOH-surfactant solutions. The initial phase of the fluid-rock investigations was adsorption studies. Surfactant adsorption is reduced when co-dissolved with alkali. Na_2CO_3 and Na_3PO_4 are more efficient at reducing surfactant adsorption than NaOH. When polymer is added to the surfactant solution, surfactant adsorption is reduced as well. When both polymer and alkali are added, polymer is the dominate component, reducing the Na_2CO_3 and NaOH effect on

adsorption. Substituting sodium ion with potassium or ammonium ion increased or decreased surfactant adsorption depending on surfactant structure with alkali having a less significant effect. No consistent change of surfactant adsorption with increasing salinity was observed in the presence or absence of alkali or polymer.

14823 (DOE/BC/14891–6) **Interdisciplinary study of reservoir compartments. Annual technical report.** Van Kirk, C.W. Colorado School of Mines, Golden, CO (United States). Dept. of Petroleum Engineering. 28 Oct 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14891. Order Number DE95010485. Source: OSTI; NTIS; GPO Dep.

This DOE research project was established to document the integrated team approach for solving reservoir engineering problems. The goal will be to provide tools and approaches that can be used to detect reservoir compartments, reach a better reserve estimate, and improve profits early in the life of a field. Field selection consumed nearly the first four months of the project. The choice was the Hambert Field area which is the field area being studied. During the remainder of the year, a significant portion of the data was gathered and entered into a data base. Cores have been described, log analysis performed on over 100 wells, and regional mapping and correlation of sedimentary packages completed. Compressional (P) and shear (S) wave velocity data was measured on 8 core plugs at various conditions and lithologies. The analysis of the 3D seismic data has been started and supports the interpretation that the structural component will be a significant factor for reservoir compartmentalization in this reservoir. The experimental permeability work completed includes the pressure decay profile permeability measurements on the cores. Relationships of porosity and permeability with net confining stress were developed. Core relative permeability measurements were also completed during the year. Additional experimental measurements completed include Young's Modulus, Shear Modulus, Poisson's ratio, and the bulk compressibility as a function of the effective stress. Preliminary engineering analysis of the pressure build-up data from two wells supports the conclusion that sealing faults may act as barriers to flow.

14824 (DOE/BC/14892–4) **Visual display of reservoir parameters affecting enhanced oil recovery.** Wood, J.R. Michigan Technological Univ., Houghton, MI (United States). Jan 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14892. Order Number DE95010782. Source: OSTI; NTIS; GPO Dep.

This project deals with visual presentation of well logging data. The decision was made to use Microsoft Access as the project Database Manager. Data tables for geochemical, petrographic, and geophysical well logs, well header information, and well production data have been completed.

14825 (DOE/BC/14956–9) **Identification and evaluation of fluvial-dominated deltaic (Class 1 oil) reservoirs in Oklahoma. Yearly technical progress report, January 1–December 31, 1993.** Mankin, C.J. (Oklahoma Geological Survey, Norman, OK (United States)); Banken, M.K. Oklahoma Univ., Norman, OK (United States). 30 Mar 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14956. Order Number DE95010483. Source: OSTI; NTIS; GPO Dep.

The Oklahoma Geological Survey (OGS), the Geological Information Systems department, and the School of Petroleum and Geological Engineering at the University of Oklahoma are engaged in a five-year program to identify and address Oklahoma's oil recovery opportunities in fluvial-dominated deltaic (FDD) reservoirs. This program includes the systematic and comprehensive collection, evaluation, and distribution of information on all of Oklahoma's FDD oil reservoirs and the recovery technologies that can be applied to those reservoirs with commercial success. Exhaustive literature searches are being conducted for these plays, both through published sources and through unpublished theses from regional universities. A bibliographic database has been developed to record these literature sources and their related plays. Trend maps are being developed to identify the FDD portions of the relevant reservoirs, through accessing current production databases and through compiling the literature results. A reservoir database system also has been developed, to record specific reservoir data elements that are identified through the literature, and through public and private data sources. Thus far, the initial demonstration for one has been completed, and second is nearly completed. All of the information gathered through these efforts will be transferred to the Oklahoma petroleum industry through a series of publications and workshops. Additionally, plans are being developed, and hardware and software resources are being acquired, in preparation for the opening of a publicly-accessible computer users laboratory, one component of the technology transfer program.

14826 (DOE/BC/14958–9) **Green River Formation Water Flood Demonstration Project, Uinta Basin, Utah. Quarterly technical progress report, October 1, 1994–December 31, 1994.** Lomax, J.D. (Lomax Exploration Co., Denver, CO (United States)); Nielson, D.L.; Deo, M.D. Lomax Exploration Co., Denver, CO (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14958. Order Number DE95010477. Source: OSTI; NTIS; GPO Dep.

The project is designed to increase recoverable petroleum reserves in the United States. In 1987, Lomax Exploration Company started a water flood in the Monument Butte unit, targeting the Green River Formation. This was a low-energy, geologically heterogeneous reservoir producing a waxy crude oil. Primary production yielded about 5% of the OOIP. The water flood was very successful, and it is estimated that the total production from the unit will exceed 20% of OOIP. The objective of this project was to evaluate the successful Monument Butte unit water flood and transfer the technology to other parts of the unit and to the Travis and Boundary units. Progress reports are presented for field drilling and production of the Monument Butte unit, Travis unit, and Boundary unit; and reservoir analysis near wellbore effects.

14827 (DOE/BC/14960–7) **Post waterflood CO_2 miscible flood in light oil, fluvial-dominated deltaic reservoir. FY 1993 annual report.** Davis, D.W. Texaco Exploration and Production, Inc., New Orleans, LA (United States). Mar 1995. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14960. Order Number DE95000120. Source: OSTI; NTIS; GPO Dep.

The project is a Class 1 DOE-sponsored field demonstration project of a CO_2 miscible flood project at the Port Neches Field in Orange County, Texas. The project will determine the recovery efficiency of CO_2 flooding a waterflooded and a partial waterdrive sandstone reservoir at a depth of 5,800. The project will also evaluate the use of a horizontal CO_2 injection well placed at the original oil-water contact of the waterflooded reservoir. A PC-based reservoir screening model will be developed by Texaco's research lab in Houston and Louisiana State University will assist in the development of a database of fluvial-dominated deltaic reservoirs where CO_2 flooding may be applicable. This technology will be transferred throughout the oil industry through a series of technical papers and industry open forums.

14828 (DOE/BC/14961–6) **Dynamic enhanced recovery technologies. Quarterly technical report, October–December, 1994.** Anderson, R.N. Columbia Univ., Palisades, NY (United States). Lamont-Doherty Earth Observatory. 15 Jan 1995. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14961. Order Number DE95010484. Source: OSTI; NTIS; GPO Dep.

This is a progress report on a US Department of Energy research project on oil and gas reservoirs located in and around Eugene Island area of offshore Louisiana. The project involves the collection of seismic data for reinterpretation and mapping reservoir characteristics using new techniques and visualization software. Based on this and other information test wells were drilled into growth fault zones of the reservoir to help determine information on fluid migration and trapping mechanisms. Other information being collected during this research is information on reservoir geochemistry, construction of pressure and temperature maps, and stratigraphy. Salt diapirs are also investigated as to age and chemical composition and structure.

14829 (DOE/BC/14970–2) **Gypsy field project in reservoir characterization. Quarterly report, October 1, 1994–December 31, 1994.** O'Meara, D.J. Jr. Oklahoma Univ., Norman, OK (United

States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94BC14970. Order Number DE95010377. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to use the extensive Gypsy Field laboratory and data set as a focus for developing and testing reservoir characterization methods that are targeted at improved recovery of conventional oil. The Gypsy Field laboratory consists of coupled outcrop and subsurface sites which have been characterized to a degree of detail not possible in a production operation.

14830 (DOE/BC/14977–3) **Improved efficiency of miscible CO_2 floods and enhanced prospects for CO_2 flooding heterogeneous reservoirs. Quarterly technical progress report, October 1, 1994–December 31, 1994.** Grigg, R.B.; Heller, J.P.; Schechter, D.S. New Mexico Petroleum Recovery Research Center, Socorro, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94BC14977. (PRRC–95-9). Order Number DE95010383. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to improve the effectiveness of carbon dioxide flooding in heterogeneous reservoirs. Activities are being conducted in three closely related areas: (1) further exploration of the applicability of selective mobility reduction in the use of foam flooding, (2) possible higher economic viability of floods at slightly reduced carbon dioxide injection pressures, and (3) taking advantage of gravitational forces during low IFT carbon dioxide flooding intight, vertically fractured reservoirs.

14831 (DOE/BC/14983–3) **Recovery of bypassed oil in the Dundee Formation using horizontal drains. Quarterly report, October 1994–December 1994. 1st Quarter, FY 1995.** Wood, J.R. Michigan Technological Univ., Houghton, MI (United States). Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94BC14983. Order Number DE95010382. Source: OSTI; NTIS; GPO Dep.

This focus of this project is to consider the enhanced recovery of petroleum from the Dundee deposit using horizontal wells. Evaluation wells are being drilled. This report contains summaries of administrative aspects of the project and a discussion of software developed for the project.

14832 (DOE/BC/14984–2) **Improved recovery demonstration for Williston Basin carbonates. Quarterly report, October 1, 1994–December 31, 1994.** Luff Exploration Co., Denver, CO (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94BC14984. Order Number DE95010379. Source: OSTI; NTIS; GPO Dep.

The purpose of this project is to demonstrate targeted infill and extension drilling opportunities, better determinations of oil-in-place, methods for improved completion efficiency and the suitability of waterflooding in certain shallow-shelf carbonate reservoirs in the Williston Basin, Montana, North Dakota and South Dakota. Results of seismic surveys are presented.

14833 (DOE/BC/14990–2) **Application of reservoir characterization and advanced technology to improve recovery and economics in a lower quality shallow shelf carbonate reservoir. Fourth quarterly technical progress report, [October 1, 1994–December 31, 1994].** Taylor, A.M. Oxy USA, Inc., Welch, TX (United States). 30 Jan 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94BC14990. Order Number DE95010471. Source: OSTI; NTIS; GPO Dep.

The focus of the project is to show that the use of advanced technology can improve the economics of CO_2 projects in low permeability reservoirs. The approach involves the use of tomography and pore throat measurements to enhance reservoir characterization. Cyclic CO_2 stimulations and frac treatments will be used to increase and facilitate oil recovery to improve project economics. Reservoir description and simulation will be used along with cyclic CO_2 stimulation and frac treatments to arrive at an optimum operating plan to be instituted during the second budget period. The official start up of the project was 8/3/94, so 12/31/94 represents the end of the second quarter. However, work in the area of cyclic CO_2 stimulation and reservoir characterization had taken place prior to the official start date under pre-award approval. Object to be accomplished during the second quarter included: detailed petrophysical description of cores from the observation wells; integrate the petrophysical data into a geologic model; acquire the tomography surveys; initiate processing of tomographic data; complete enhanced interpretation of 3-D seismic volume in the DOE demonstration area; develop relationship between seismic attributes and well log parameters; and complete cyclic CO_2 stimulation treatments. A majority of these objectives were accomplished during the fourth quarter of 1994. There are still six tomography surveys to be conducted during January. Processing of the tomographic data has gotten off to a slow start, but will accelerate with an upgrading computing power. The initial CO_2 injection into one of the cyclic wells has not been completed.

14834 (DOE/CE/15600–T5) **Method for cutting steam heat losses during cyclic steam injection of wells. Fifth quarterly report.** S-Cal Research Corp., San Rafael, CA (United States). Mar 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG49-93CE15600. Order Number DE95010371. Source: OSTI; NTIS; GPO Dep.

The estimated Heavy Oil reserves of the Cat Canyon field, in Southern California, are about 27 MMB, of which only a little more than 1 MMB have been produced, since its discovery in 1908.This very slow recovery rate is due to several causes: (1) The 8 - 10 API oil is very viscous; (2) The main reservoir sand (Sisquoc of Late Pliocene, early Miocene Age) at depths ranging from 2,200 ft to 3,000 ft requires high-temperature, high-pressure steam (up to 600 F at 1,550 psia), resulting in high tubing heat loss with conventional well configurations; (3) The friable sand is very fine-grained and easily entrained by the produced viscous crude. Although cyclic steam injection methods have been used successfully in this field, their cost is increased by the large tubing heat losses. This problem may be alleviated by using our sequential cyclic steam injection process, but the high pumping cost resulting from the presence of sand in the pumped crude stream may only be addressed by a special type of oil pump, which requires two parallel tubings. The addition of a third tubing in the basic 10.75 inches. Cased well configuration, developed for the Midway-Sunset field is feasible, but the downhole flow connection between the twin tubings of the pump must be included in our Lower Special Casing Joints. In view of the interest expressed by a Cat Canyon Operator to field-test our Downhole Hardware and technology, the present Report describes the design modifications which have been made to the Top Lower Special Joint (TLSJ), presented in Report No. 3 in order to include this feature, thus allowing the use of a sand-tolerant pumping system, when necessary. These low-cost modifications will extend the range of applicability of our technology and facilitate its market penetration.

14835 (DOE/MT/94003–2) **Assistance to the states with risk based data management. Quarterly technical progress report, October 1, 1994–December 31, 1994.** Paque, M.J. Underground Injection Practices Council Research Foundation, Oklahoma City, OK (United States). 30 Jan 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94MT94003. Order Number DE95010386. Source: OSTI; NTIS; GPO Dep.

The following is a quarterly Technical Progress Report of the Risk Based Data Management Systems (RBDMS) project. This project is administered by the Underground Injection Practices Research Foundation (UIPRF) which is the foundation of the Ground Water Protection Council (GWPC).

14836 (NEI-NO–537) **State-of-the-art fracturing in the North Sea.** Domelen, M.S. van (Halliburton Energy Services (Netherlands)); Jacquier, R.C.; Sanders, M.W. Norsk Petroleumsforening, Oslo (Norway). 1994. 22p. (CONF-9408229–44: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766613. Source: OSTI; NTIS.

The present paper focuses on recent advances in hydraulic fracturing technology with emphasis on North Sea applications. Improved pre-treatment diagnostic techniques and better understanding of the effects of completion design, have significantly increased the success rate of fracturing deviated and horizontal wells. Recent advances in diagnostic injection tests, real-time treatment analysis, and on-site redesign capabilities help ensure that hydraulic fracturing can be successfully applied in marginal fields.

Seawater fracturing fluid systems need refinement, and surface equipment pressure limitations need to be expanded. The North Sea is using high-permeability reservoirs to enhance the overall profitability of the project and as an alternative to traditional sand control applications in soft, weakly consolidated reservoirs. Advances in fluid design and post-treatment flowback procedures have minimized the effects of hydraulic fracturing, and service companies are applying environmental criteria early in the process of chemical development. 78 refs., 19 figs., 2 tabs.

14837 (NEI-NO–538) **Drilling fluid technology. Meeting the environmental challenges.** Young, S. (Anchor Drilling Fluids (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–45: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766614. Source: OSTI; NTIS.

The conference paper deals with advanced drilling fluid technology. Current and future developments in the North Sea area are likely to present ever increasing technical and environmental challenges. The economics of such developments will dictate maximum technical performance from the drilling fluid. The ongoing developments and success of water based drilling fluids have challenged oil based drilling fluid performance. The reduction of environmental impact and extension of the technical performance of these fluids in extended reach, slim hole and horizontal drilling, where formation damage, lubricity, and wellbore stability aspects of these fluids have been greatly improved, these new generation water based fluids are to be readily used in wells which were previously considered "oil base only". 1 tab.

14838 (NEI-NO–539) **Multilateral completion technology.** Hay, B. (Baker Oil Tools (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 11p. (CONF-9408229–46: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766615. Source: OSTI; NTIS.

The conference paper focuses on the recent advances and developments in completion systems to address multilateral completions with current capabilities and trends. The systems, with their advantages and disadvantages included, are as follow: Generic application variants; multi-branch system with isolation; dual lateral systems; combination system with full selective reentry; downhole splitter system. Because splitter wells share the same surface location and casing, the process takes less time and materials than drilling two conventional wells. An estimation of the drilling time saved for the splitter well is 8-10 days for each additional well drilled. 7 figs.

14839 (NEI-NO–540) **HT/HP operations. Challenges in planning, drilling and testing HPHT wells.** Aarrestad, T.V. (Statoil (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 13p. (CONF-9408229–47: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766616. Source: OSTI; NTIS.

High Pressure/High Temperature (HPHT) wells have been recognised to have a rather high cost for drilling and testing compared with both standard wells and other deep wells. STATOIL realised the need for a multi-company technology programme on planning, drilling and testing such wells. The paper discusses some of the items investigated in this programme with 12 major oil companies involved. Four projects were established: Prediction, Drilling, Testing and Post Analysis. Major challenges and problem areas have been investigated through specific activities. Pore pressure prediction has been studied both from geophysical and basin modelling concept. Items such as Rig Requirements, Casing Design, Down Hole Equipment and Cementing Techniques have been evaluated. Design verification and equipment testing are included to give increased understanding of problems both in drilling and testing HPHT wells. 2 refs., 6 figs., 1 tab.

14840 (NEI-NO–542) **Cementing/additives technology enhancement.** Bianchi, R. (Wheaterford (Italy)); Riccobon, L. Norsk Petroleumsforening, Oslo (Norway). 1994. 9p. (CONF-9408229–49: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766618. Source: OSTI; NTIS.

The conference paper deals with the exploration and development of ultra deep reservoirs located at 7.000 m. The combination of BHP pressure (1.000 bar) and high temperature (close to 200°C) together with long cementing intervals has driven the development of drilling and cementing innovative technology to positively face these critical HP/HT requirements. The best conditions for primary cementing should be established long before the actual cementing operation. According to the author, advanced cementing products and technology integrated by effective slurry additives are vital items but not unique. In HP/HT severe conditions, great attention must be paid for all the variable influencing factors connected with phase optimisation. The paper discusses the optimization of drilling, casing running, and cementing. 4 figs., 6 tabs.

14841 (NEI-NO–557) **The worldwide IOR challenge seen from an international oil company's viewpoint.** Guillon, O. (Elf Geoscience Research Centre (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 21p. (CONF-9408229–64: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766633. Source: OSTI; NTIS.

The conference paper deals with methods of improving oil recovery processes. According to the author, the maturity of the North Sea as an oil and gas province would provide an excellent opportunity to promote improved recovery applications while the infrastructure still exists. It would appear that the gas injection process is the best adapted recovery process, because of the low oil viscosity, the possibility of gravity stabilisation, and the high reservoir permeability that usually prevails. Studies show a large potential for additional oil recovery by gas injection. To be successful, it will undoubtedly be associated with technical innovation (horizontal wells, light platforms) and new combination of existing technologies. Innovations in the systems of taxation and regulation would be equally important, providing incentives for those operators willing to risk considerable investment now, which would be crucial to avoid wasting vast natural resources in the future. 8 refs., 21 figs., 1 tab.

14842 (NEI-NO–558) **IOR-options and challenges on the Norwegian Continental Shelf.** Nystad, A.N. (Oljedirektoratet (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–65: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766634. Source: OSTI; NTIS.

The average recovery for the about 30 oil fields in production and under development on the Norwegian Continental Shelf is 36%. The Norwegian Petroleum Directorate (NPD) has suggested a long term goal to increase the average recovery rate to 45%. Such a goal will add another 400-500 million tons of oil, or approximately 3.0-3.5 billion barrels, in relation to these oil fields. If the portfolio of other discoveries and the possibility of further technological advances are included, the total upside potential for improved oil recovery on the Norwegian shelf relative to todays assumptions might be as high as 800-900 million tons or approximately 6.0-6.5 billion barrels.

14843 (NEI-NO–559) **The IOR experience and strategies related to some UK fields.** Brealey, N.J. (British Petroleum Exploration (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 9p. (CONF-9408229–66: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766635. Source: OSTI; NTIS.

The conference paper discusses methods and experience by improved oil recovery on the UK continental shelf. Topics are: Cost target; a changing world - a changing industry; improved oil recovery (IOR) efforts; early enhanced oil recovery (EOR) efforts; Forties chemical EOR experience; other Forties EOR experience; Thistle experience; non BP EOR experience; other technology innovation; technology strategy for the future. 9 refs., 4 figs.

14844 (NEI-NO–560) **The IOR experience and strategies related to some Norwegian fields.** Utseth, R.H. (Statoil (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 31p. (CONF-9408229–67: ONS '94: 11. international Offshore Northern Seas

conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766636. Source: OSTI; NTIS.

The conference paper discusses the strategies of enhanced oil recovery on the Norwegian continental shelf together with the obtained experience so far. Topics cover: Technical achievements and pilot tests: lessons learned; going for capillary-trapped oil: surfactant pilot in Gullfaks; combined water/gas injection flood; non-swept oil: water shutoff with silica-gel; risk-reward analysis: comparison with prospect evaluation and risk-evaluation in the Statfjord field; the impact of reservoir description in IOR; management issues; the role of the governmental authorities. 17 figs.

0204 Processing

Refer also to citation(s) 14713

14845 (DOE/MT/92020–9) **Improvement of hydrogen solubility and entrainment in hydrocracker feedstocks. Quarterly technical report, October 1, 1994–December 31, 1994.** Kabadi, V.N. North Carolina Agricultural and Technical State Univ., Greensboro, NC (United States). Dept. of Chemical Engineering. [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92MT92020. Order Number DE95010788. Source: OSTI; NTIS; GPO Dep.

Hydrogen solubility in different crude oil fractions was predicted using modified UNIFAC. A new procedure for characterizing crude oil fractions has been established. Functional group concentrations were estimated by means of suggested group models with non-integer number n as a function of temperature. The validity of the model structure was tested by calculating the deviation between predicted and experimental molecular weights. The procedure has been found to work well for different petroleum fractions. The hydrogen solubility was calculated by modified UNIFAC model with the new interaction parameters as a function of temperature. The comparison between predicted and experimental solubilities confirms the suggested model structure for crude oil cuts validity. It was found that hydrogen solubilities could be reasonably predicted by using modified UNIFAC with 12% average error at atmospheric pressure.

0205 Products and By-Products

Refer also to citation(s) 15708

0206 Health and Safety

Refer also to citation(s) 16309

14846 (NEI-NO–553) **The pursuit of health, safety and environment objectives.** Armstrong, K. (Chevron Overseas Petroleum, Inc. (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 14p. (CONF-9408229–60: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766629. Source: OSTI; NTIS; INIS.

The conference paper examines certain issues facing E and P companies with respect to health, safety and environment (HSE) management and costs. It reviews some of the pressures forcing companies to increase their HSE cost reductions. It discusses the critical role that risk management plays in efforts to resolve these competing pressures so as to best protect shareholder value, and it identifies some areas for potential improvement. Finally, it examines the contribution industry partnerships with government can make in promoting cost-effective HSE risk management. 8 refs.

14847 (NEI-NO–554) **The role of trade unions in the pursuit of HSE-goals.** Fjelldal, T. (Norwegian Oil and Petrochemical Union, NOPEF (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 9p. (CONF-9408229–61: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766630. Source: OSTI; NTIS; INIS.

The conference paper discusses the role of trade unions in Norway in pursuing Health, Safety, Environment (HSE). In the Norwegian tradition social responsible unions, broad participation, continuous development of the company organization, are key factors to improve the working environment. In laws and agreements the unions have a well-defined role in pursuing HSE goals. Joint action programmes between the confederations NHO/LO (Norwegian Employers' Confederation/Norwegian Federation of Trade Unions) and other investments in HSE, pays off. The paper concentrates on the HSE-organization, factors which might improve the working environment, and the union role. 10 refs., 7 figs.

14848 (NEI-NO–555) **The role of statutory regulation in the pursuit of HSE-goals.** Ognedal, M. (Oljedirektoratet, Stavanger (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–62: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766631. Source: OSTI; NTIS.

The conference paper discusses the role of statutory regulation on efficient management of offshore safety, health and environment in Norway. Topics are as follow: The need for statutory regulation of petroleum industry; the regulators' role as a standard setter; trends in the development of the regulators' role as a standard-setter; trends in the development of the regulators' role as a supervisor.

14849 (NEI-NO–556) **Developments within safety, health and environment standards and regulator systems in North-Western Europe.** Hughes, H.W.D. (UK Offshore Operators Association (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 14p. (CONF-9408229–63: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766632. Source: OSTI; NTIS.

The scope of the present paper is to cover offshore environmental matters by addressing environmental standards and regulator systems in North-Western Europe. Aspects discussed here are as follow: Safety performance in the UK offshore industry; The UK offshore safety regime - status and issues; costs of offshore safety in the UK; some issues relating to European Union (EU) legislation; safety issues at European, North Sea, level; regulatory approaches to environmental issues. 6 figs.

0207 Economic, Industrial, and Business Aspects

Refer also to citation(s) 14790, 15704

14850 (DOE/EIA–0380(95/04)) **Petroleum Marketing Monthly, April 1995, with data for January 1995.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Apr 1995. 196p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009667. Source: OSTI; NTIS; GPO Dep.

International crude oil prices rose moderately in January 1995, under the combined influences of lower production and higher demand. Crude oil output both from the Organization of Petroleum Exporting Countries (OPEC) and from non-OPEC nations declined from December levels due to a variety of causes, including severe weather in the North Sea and a platform explosion offshore Nigeria. At the same time, strong demand, especially from Asia, revised buying patterns and tightened markets worldwide. In the United States, reformulated gasoline (RFG) remained the dominant market influence, with the official start of the program at the retail level on January 1. Repercussions from the "opting out" of counties in Pennsylvania, New York, and Maine in December continued to disrupt supply patterns and confuse markets. Gasoline prices spiked at mid-month, but ended near where they began, while distillate prices declined due to warm weather and high inventories. A sharp seasonal decline in motor gasoline volumes led total refiner sales of the major petroleum products down 5.9 percent from December levels. January market and sales activity for crude oil and the principal petroleum products is summarized in the following sections.

14851 (IEE-SR–258) **Trends of oil producing countries in the world. Mostly on national oil companies.** Institute of Energy Economics, Tokyo (Japan). Aug 1994. 170p. (In Japanese). Order Number DE95769735. Source: OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan.

The paper describes the oil situation surrounding national oil companies in major oil producing countries in the world and future prospect, and analyzes resource open policies. If classifying the trends of the international oil market into a scenario of the open market and a scenario of the managing market, the market seems to be moving along the open market. OPEC has been increasing its market share in and after the middle of the 1980s, but hasn't regained the price-ruling power yet. Future problems for the scenario of the open market are the environment and restrictions on investment in increasing petroleum production capacity caused by shortage of funds. With regard to the environmental issue, a study is made on introduction of an 'oil well root tax' by oil producing countries against introduction of the carbon tax by developed countries. Of national oil companies in Europe, the U.S., and Central America, attention is paid to promotion of privatization and gradual reduction in number of shares held by government. This is because partially of privatization as part of relaxation of regulations arising from accepting IMF's financial assistance due to the state finance being aggravated. 98 figs., 42 tabs.

14852 (MMS–94-0060) **Federal Offshore Statistics, 1993. Leasing, exploration, production, and revenue as of December 31, 1993.** Francois, D.K. Minerals Management Service, Herndon, VA (United States). 1994. 171p. Sponsored by Department of the Interior, Washington, DC (United States). Source: OSTI; INIS; Minerals Management Service, Technical Communications Service, 381 Elden Street, MS 4530, Herndon, Virginia 22070-4817 (United States).

This document contains statistical data on the following: federal offshore lands; offshore leasing activity and status; offshore development activity; offshore production of crude oil and natural gas; federal offshore oil and natural gas sales volume and royalties; revenue from federal offshore leases; disbursement of federal offshore revenue; reserves and resource estimates of offshore oil and natural gas; oil pollution in US and international waters; and international activities and marine minerals. A glossary is included.

14853 (NEI-NO–499) **New frontiers for tomorrow's world.** Kassler, P. (Shell International Petroleum Co. Ltd., London (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 10p. (CONF-9408229–6: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766575. Source: OSTI; NTIS; INIS.

The conference paper deals with new frontiers and barricades in the global economic development and their influence on fuel consumption and energy source development. Topics discussed are incremental energy supply - new frontiers, world car population - new frontiers, OPEC crude production capacity vs call on OPEC, incremental world oil demand by region 1992-2000, oil resource cost curve, progress in seismic 1983-1991, Troll picture, cost reduction in renewables, sustained growth scenario, nuclear electricity capacity - France, OECD road transport fuels - barricades, and energy taxation. 18 figs.

14854 (NEI-NO–513) **The need for getting the balance right in matching economy, technology and people.** Norvik, H. (Statoil (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 14p. (CONF-9408229–20: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766589. Source: OSTI; NTIS; INIS.

The exploitation of the North Sea has reached a mature stage, and the dependency on new gigantic field discoveries to provide the returns needed in future are changing. According to the author of this paper, excellence in management of change will be as important as technical excellence in obtaining success and to get the right balance between technology, economy and employees to maintain competitiveness on the Norwegian Continental Shelf. The aim of Statoil is to improve the profitability in the range of 12%, and to reduce costs and time by 30-40%. A cost reduction of 25% within the drilling sector is obtained. Alliances are built to utilize synergies, reduce costs and develop new business opportunities. Trade union representatives have a lot to offer in the Board of the Company and in the internal work in the company as well. Safety aspects are added.

14855 (NEI-NO–514) **Technical developments in other industries and right-sizing of organizations. A retrospective view of corporate down sizing in the U.S.** Kragness, M.E. (ROI Consultants, Inc., Minneapolis, MN (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 23p. (CONF-9408229–21: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766590. Source: OSTI; NTIS; INIS.

The conference paper deals with the Amoco sweeping plan to boost profits and expand operations in US. The company refocused its oil exploration strategy and sought a cultural transformation within the organization in addition to cutting payroll. The paper offers background to help understanding why corporate downsizing has become a popular and perhaps necessary management strategy using the collective experience of many U.S. companies to examine how downsizing has occurred and its human and financial consequences. The paper offers several approaches to workforce management, which address the need to increase employee productivity and corporate profits while minimizing the human and financial costs of layoffs. 40 refs.

14856 (NEI-NO–515) **Consequences for people from changed economic requirements and implementations of new technology.** Myhre, L.A. (Norwegian Oil and Petrochemical Union, NOPEF (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–22: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766591. Source: OSTI; NTIS; INIS.

The offshore oil and gas business has reached mature levels where improvements and efficiency, optimisation and down-sizing are necessary to achieve required economic performance. The paper discusses the oil worker in future with the focus on manning and safety as a consequence of new technologies and cost reduction. 1 fig.

14857 (NEI-NO–516) **The human element of right-sizing. BP experiences.** Hollis, J.W. (BP Norge (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 5p. (CONF-9408229–23: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766592. Source: OSTI; NTIS; INIS.

BP (British Petroleum) Exploration has been engaged in a worldwide repositioning exercise to improve its business performance. Despite a 40% fall in average oil price, the profitability and revenues have both grown, while the workforce has more than halved. BP is now able to test itself against price assumptions as low as $ 14 a barrel and make as good a return as it was near to $ 20. The paper discusses such a process of repositioning.

14858 (NEI-NO–517) **The experience of western oil companies in Russia.** Moerland, A. (Amoco Erusia Petroleum Co., Moscow (Russian Federation)). Norsk Petroleumsforening, Oslo (Norway). 1994. 8p. (CONF-9408229–24: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766593. Source: OSTI; NTIS; INIS.

The oil and gas industry is the most important industry to Russia providing 52% of all hard currency earnings for the country. The oil production is declining by more than 30% during recent years from 10.3 billion barrels per day in 1990 to 7.1 billion barrels today. The paper discusses the Amoco engagement in the Priobskoye Field in western Siberia containing up to 5 billion barrels of recoverable oil requiring capital investments of more than 25 billion dollars over the first 20 years. Over the last five years, foreign companies have worked with their Russian counterparts to complete numerous feasibility studies on many projects. In the next few months, important developments may take place such as the offshore Sakhalin in the East and the Timan Pechora region in the North. The experienced barriers connected to the activities, burden of taxes, policy issues etc., are dealt with.

14859 (NEI-NO–519) **Session cost efficient solutions for field development.** Taranger, K.P. (Saga Petroleum A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 12p. (CONF-9408229–26: ONS '94: 11. international Offshore Northern

Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766595. Source: OSTI; NTIS; INIS.

Oil companies in Norway and the oil related industry are presently in the middle of a one year long, and quite substantial, efficiency-process named NORSOK. The NORSOK has the objective of finding more cost- and time-efficient ways of exploiting oil and gas from the Norwegian Continental Shelf. The paper discusses the industrial participation in the NORSOK working groups. It presents the changes to be foreseen as a result of experience gained, through previous projects as well as efficiency processes, and which will be applied to the planning and execution of two current field development projects, namely the Vigdis field in the North Sea and the Midgard field in the Haltenbanken area.

14860 (NEI-NO–522) **A new approach to cost effective projects: High performance project teams.** Chambers, N.C. (Brown and Root Energy Services (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 10p. (CONF-9408229–29: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766598. Source: OSTI; NTIS; INIS.

In low oil price environment in which environmental conditions are more challenging, reservoir characteristics less favourable and political risk increasing, successful projects are required in such cases. The present paper deals with the visionary process of establishing high performance project teams. According to the author, such project teams embody dynamic recognition of holism. Holism is achieved as an output from the process of establishing the drivers and enablers for success on a project. They are given birth during the unfolding of the operators development plans and contracting strategy. The paper discusses the main drivers of project teams comprising purpose and performance goals, selection, common approach, commitment and accountability, and financial alignment.

14861 (NEI-NO–523) **System supplier approach to projects and operations efficiency.** Moe, P.O. (Siemens Offshore A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 11p. (CONF-9408229–30: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766599. Source: OSTI; NTIS; INIS.

The conference paper outlines the most important elements for a new approach to project realisation that enable a cost reduction of 30-50% compared to conventional methods. The achievements are based on studies and evaluations to the Norwegian Vigdis development project. The system elements covered are the electrical and automation systems including safety and process control and all traditional phases of a project from concept design to the operational phase. The concept involves new principles for project execution where traditional borderlines and interfaces between the various participants have been redefined. Management attention has been verified as an important prerequisite for a successful implementation of this strategy. 2 figs.

14862 (NEI-NO–531) **Advantages of the production contractor concept.** Gisvold, K.M. (Golar-Nor Offshore, Trondheim (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 13p. (CONF-9408229–38: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766607. Source: OSTI; NTIS; INIS.

This paper presents some thoughts on the Production Contractor concept. It starts with an attempt to define the prerequisites for such contractorship to exist and develop, going on to examine the considerations that the oil company and the contractor respectively have to go through, and finally trying to summarize what emerges as the advantages of production contracting. Examples are given to emphasize particular points.

14863 (NEI-NO–532) **The world market for subsea technology.** Kvinnsland, O.-J. (Norland Consultants A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 18p. (CONF-9408229–39: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766608. Source: OSTI; NTIS; INIS.

The conference paper deals with the Petrobase 2000 system designed for forecasting and analysis of offshore activities covering files of exploration, field development and operations. The electronic tool system forecasts offshore activities in a total of 90 countries around the world. Exploration activities are analysed on the basis of prospectivity of basin geology, availability of exploration acreage, terms of conditions applying as well as availability exploration services, regionally or nationally. The field development file contains data on all known discoveries offshore and announced plans for development. For discoveries where no plans for development exist, the tool system allows for a probability analysis to identify the most likely scheme and scheduling. 10 figs.

14864 (NEI-NO–533) **Cost reduction through system integration.** Helsing, P. (Kvaerner Energy (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 10p. (CONF-9408229–40: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766609. Source: OSTI; NTIS; INIS.

In resent years cost reduction has been a key issue in the petroleum industry. Several findings are not economically attractive at the current cost level, and for this and other reasons some of the major oil companies require the suppliers to have implemented a cost reduction programme to prequalify for projects. The present paper addresses cost reduction through system design and integration in both product development and working methods. This is to be obtained by the combination of contracts by reducing unnecessary coordination and allow re-use of proven interface designs, improve subsystem integration by "top down" system design, and improve communication and exchange of experience. 3 figs.

0208 Waste Management

14865 (DOE/MT/92009–10) **Evaluation of the freeze-thaw/evaporation process for the treatment of produced waters. Quarterly technical progress report, October 1–December 31, 1994.** Boysen, J.; Morotti, J. Resource Technology Corp., Laramie, WY (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92MT92009. Order Number DE95010790. Source: OSTI; NTIS; GPO Dep.

The objectives of this research are related to development of a commercially-economic natural freezethaw/evaporation (FTE) process for the treatment and purification of water produced in conjunction with oil and gas. During the reporting period of 10/l/94 to 12/31/94, project research concentrated on Subtasks 2.0 (Task 2 Project Reporting) and 2.1 (Laboratory scale FTE Simulations). The objectives of Task 2 are to conduct laboratory- and bench-scale simulations for optimizing the design of the FTE process. Task 2 requires completion of six subtasks: Subtask 2.0 – Task 2 Project Reporting (initiated 3/l/93), Subtask 2.1 – Laboratory-scale FTE Simulations, Subtask 2.2 Re-evaluation of Process Economics Based on Laboratory-scale Process Simulation Results, Subtask 2.3 – Bench-scale FTE Simulations, Subtask 2.4 – Economic Assessment of Bench-scale Simulations, and Subtask 2.5 – Technical Report of Task 2. The completion of Subtasks 2.1 and 2.2 were planned for this quarter.

0209 Environmental Aspects

Refer also to citation(s) 14846, 14847, 16552, 16574

14866 (DOE/MT/91004–1) **Analysis of environmental constraints on expanding reserves in current and future reservoirs in wetlands. Final report.** Harder, B.J. Louisiana State Univ., Baton Rouge, LA (United States). Center for Coastal, Energy, and Environmental Resources. Mar 1995. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91MT91004. Order Number DE95000136. Source: OSTI; NTIS; GPO Dep.

Louisiana wetlands require careful management to allow exploitation of non-renewable resources without destroying renewable resources. Current regulatory requirements have been moderately successful in meeting this goal by restricting development in wetland habitats. Continuing public emphasis on reducing environmental impacts of resource development is causing regulators to reassess their regulations and operators to rethink their compliance strategies. We examined the regulatory system and found that reducing the number of applications required by going to a single

application process and having a coherent map of the steps required for operations in wetland areas would reduce regulatory burdens. Incremental changes can be made to regulations to allow one agency to be the lead for wetland permitting at minimal cost to operators. Operators need cost effective means of access that will reduce environmental impacts, decrease permitting time, and limit future liability. Regulators and industry must partner to develop incentive based regulations that can provide significant environmental impact reduction for minimal economic cost. In addition regulators need forecasts of future E&P trends to estimate the impact of future regulations. To determine future activity we attempted to survey potential operators when this approach was unsuccessful we created two econometric models of north and south Louisiana relating drilling activity, success ratio, and price to predict future wetland activity. Results of the econometric models indicate that environmental regulations have a small but statistically significant effect on drilling operations in wetland areas of Louisiana. We examined current wetland practices and evaluated those practices comparing environmental versus economic costs and created a method for ranking the practices.

14867 (SNV–4282) **Chemical and biological characterization of residential oil burner emission. A literature survey.** Westerholm, R.; Peterson, A. Swedish Environmental Protection Agency, Solna (Sweden). Feb 1994. 54p. Order Number DE95766692. Source: OSTI; NTIS; INIS.

This literature study covers the time period 1980 to 1993 and is concerned with oil burners used for residential heating with a nominal heating power of less than 20 kW, which are normally used in one-family houses. Emission samples from domestic heaters using organic fuels consists of a very complex matrix of pollutants ranging from aggregate states solid to gaseous. Biological effects elicited by exhaust emissions have been detected and determined. It has been shown for diesel vehicles that selection of fuel properties has an impact on combustion reaction paths which results in different exhaust chemical compositions. It was also determined that diesel fuel properties have an impact on the biological activity of diesel exhaust emissions, which is to be expected from their chemical characterization. As a result of this, Sweden has an environmental classification of diesel fuels which has been in force since 1991. Analogously, the Swedish Environmental Protection Agency has asked whether detrimental environmental and health effects from residential heating can be reduced by selection of fuel properties, and if so by how much? In addition, which properties are most important to control in a future environmental classification of heating oils? As a first step in this process, a literature survey was performed. Major topics were: Sampling technology, chemical composition, biological activity, and risk assessment of emissions. 33 refs, 11 tabs

0210 Legislation and Regulations

Refer also to citation(s) 14848, 14849, 14866, 15707

14868 (DOE/MT/94006–2) **A guidance document for Kentucky's oil and gas operators. Technical progress report, November 11, 1994–February 1, 1995.** Kentucky State Government, Frankfort, KY (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94MT94006. Order Number DE95010385. Source: OSTI; NTIS; GPO Dep.

This technical report is a summary of the progress made on "A Guidance Document For Kentucky's Oil and Gas Operators." It includes a revised outline, an introduction and summary of the state's regulatory requirements, and the Division of Oil and Gas's procedures for permitting a well. In the past quarter, several meetings of the task force have taken place. The task force is made up of a group of representatives of the exploration and production regulatory agencies in Kentucky. The first draft outline for the guidance document was reviewed by the task force and suggestions for changes were made. The group asked that the wording of the outline be simplified in order to make it easier for the small operator to understand. The group also suggested that the outline follow a more chronological order from permitting to plugging a well rather than separating the chapters by regulatory divisions. These changes were made and a new draft outline is submitted in this report. In addition to the outline, work on the first chapter has begun with a brief history of the oil and gas industry in Kentucky and how the different regulatory agencies were created. The first chapter also contains a summary of the Division of Oil and Gas's regulatory responsibilities. Summaries of the other state agencies are being prepared by the respective members of the task force. These summaries will be included in future technical reports. This report also contains the procedures for obtaining a permit from the Division of Oil and Gas. It contains instructions on filling out the permit application, the types of bonds that can be posted, and the spacing requirements in the different regions of Kentucky. This section will be included in chapter 2 of the guidance document.

0220 Transport, Handling, and Storage

Refer also to citation(s) 14879, 14896, 14897, 14898, 14901, 15135, 16326, 16327, 16328

14869 (CONF-941022–Vol.1, pp. 5-19) **Commercial jet fuel quality control.** Strauss, K.H. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The paper discusses the purpose of jet fuel quality control between the refinery and the aircraft. It describes fixed equipment, including various types of filters, and the usefulness and limitations of this equipment. Test equipment is reviewed as are various surveillance procedures. These include the Air Transport Association specification ATA 103, the FAA Advisory Circular 150/5230-4, the International Air Transport Association Guidance Material for Fuel Quality Control and Fuelling Service and the Guidelines for Quality Control at Jointly Operated Fuel Systems. Some past and current quality control problems are briefly mentioned.

14870 (CONF-941022–Vol.1, pp. 29-42) **Analytic tests and their relation to jet fuel thermal stability.** Heneghan, S.P. (Univ. of Dayton Research Institute, OH (United States)); Kauffman, R.E. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract F33615-92-C-2207. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The evaluation of jet fuel thermal stability (TS) by simple analytic procedures has long been a goal of fuels chemists. The reason is obvious: if the analytic chemist can determine which types of material cause his test to respond, the refiners will know which materials to remove to improve stability. Complicating this quest is the lack of an acceptable quantitative TS test with which to compare any analytic procedures. To circumvent this problem, we recently compiled the results of TS tests for 12 fuels using six separate test procedures. The results covering a range of flow and temperature conditions show that TS is not as dependent on test conditions as previously thought. Also, comparing the results from these tests with several analytic procedures shows that either a measure of the number of phenols or the total sulfur present in jet fuels is strongly indicative of the TS. The phenols have been measured using a cyclic voltammetry technique and the polar material by gas chromatography (atomic emission detection) following a solid phase extraction on silica gel. The polar material has been identified as mainly phenols (by mass spectrometry identification). Measures of the total acid number or peroxide concentration have little correlation with TS.

14871 (CONF-941022–Vol.1, pp. 195-209) **The effect of copper, MDA, and accelerated aging on jet fuel thermal stability as measured by the gravimetric JFTOT.** Pande, S.G. (GeoCenters, Inc., Ft. Washington, MD (United States)); Hardy, D.R. USDOE Assistant Secretary for Fossil Energy, Washington, DC

(United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Thermally unstable jet fuels pose operational problems. In order to adequately identify such fuels, factors that realistically impact on thermal stability were examined. Evaluation was based on a quantitative method of measuring thermal stability, viz., NRL's recently developed gravimetric JFTOT. This method gives a quantitative measurement of both the strip deposit and filterables formed. The pertinent factors examined, included the individual and interactive effects of: soluble copper, MDA (metal deactivator), and aging. The latter was accelerated to simulate field conditions of approximately six months aging at ambient temperature and pressure. The results indicate that the individual and interactive effects of copper, MDA, and accelerated aging appear to be fuel dependent. Based on the results, the three test fuels examined (one JP-8 and two JP-5s) were categorized as exhibiting very good, typical, and poor thermal stabilities, respectively. For both the very good and poor thermal stability fuels, the effect of copper in conjunction with accelerated aging did not significantly increase the total thermal deposits of the neat fuels. In contrast, for the typical thermal stability fuel, the combined effects of copper and accelerated aging, did. Furthermore, the addition of MDA prior to aging of the copper-doped, typical stability fuel significantly counteracted the adverse effect of copper and aging. A similar beneficial effect of MDA was not observed for the poor stability fuel. These results focus on the compositional differences among fuels and the need to elucidate these differences (physical and chemical) for a better understanding and prediction of their performance.

14872 (CONF-941022–Vol.1, pp. 303-312) **Long term storage of finished gasolines in large salt caverns.** Koenig, J.W.J. (German Strategic Petroleum Reserve, Hamburg (Germany)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Strategic oil stocking requires large low cost storage facilities. Crude oil has been held in very large salt mines and/or artificially made salt caverns for many years, notably in Europe and the USA. Following crude oil, gasoils and refinery light feed stocks have been tried also. Military organisations tried jet fuel and early cases of underground aviation gasoline storage in steel tanks have been reported.

14873 (CONF-941022–Vol.1, pp. 313-325) **A strategic storage programme for developing countries - to be or not to be?.** Morse, B.W. (Petroleum Management Consultant, Moss (Norway)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

In the industrialised world agreements between countries or legislation will dictate that there shall be strategic fuel storage of "X" amount of days. What about the developing countries, the third world? For the most part they have no storage regulations. Should they consider a strategic fuel storage programme? If so, how can they go about it? What are the obstacles? Many have neither the technical expertise nor the monies. This paper will explore how developing countries can have a strategic oil storage programme - How they can plan, justify, finance, execute and operate such a storage without having a major impact on their countries.

14874 (CONF-941022–Vol.1, pp. 327-335) **Use of ASTM D5304 in assessing unstable diesel fuel.** Turner, L.M. (Defense Fuel Supply Center, Alexandria, VA (United States)); Martin, C.J.; Beal, E.J.; Hardy, D.R. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The storage stability, or the length of time a fuel can be stored, is of great concern to diesel fuel users. This paper reports on the use of the new ASTM accelerated test for storage stability by oxygen overpressure (D5304) to predict future storage life span of 63,000,000 gallons of a diesel fuel for US Naval vessel use. This paper demonstrates the use of ASTM D5304 at storage times of 16, 40 and 96 hours to accurately determine the length of time that this large quantity of diesel fuel could be stored at ambient temperatures before the maximum allowable amount of particulate contamination was reached.

14875 (CONF-941022–Vol.1, pp. 337-347) **Metal-deactivating additives for liquid fuels.** Boneva, M.I. (Institute of Organic Chemistry, Sofia (Bulgaria)); Ivanov, S.K.; Kalitchin, Z.D.; Tanielyan, S.K.; Terebenina, A.; Todorova, O.I. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The metal-deactivating and the antioxidant properties of 1-phenyl-3-methylpyrazolone-5 derivatives have been investigated both in the model reaction of low temperature oxidation of ethylbenzene and in gasoline oxidation. The study of the ability of these derivatives to reduce the catalytic effect of copper naphthenate demonstrates that they are promising as metal deactivating additives for light fuels. Some of the pyrazolone compounds appear to be of special interest for the long-term storage of liquid fuels due to their action as multifunctional inhibitors.

14876 (CONF-941022–Vol.2) **Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 2.** Giles, H.N. (ed.). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. Apr 1995. 514p. Sponsored by USDOE, Washington, DC (United States). From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. Order Number DE95009411. Source: OSTI; NTIS; GPO Dep.

Volume 2 of these proceedings contains 34 papers divided into the following sessions: Deposit and insolubles measurement (5 papers); Gasolines (4 papers); Heavy oils and refinery processing (3 papers); Middle distillate fuels (7 papers); New fuels and environmental mandates (5 papers); and a Poster session (10 papers). Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

14877 (NEI-NO–552) **Multiphase transport, experiences and challenges.** Lingelem, M.N. (Norsk Hydro A/S, Oslo (Norway)); Haaheim, S.; Aarvik, A. Norsk Petroleumsforening, Oslo (Norway). 1994. 7p. (CONF-9408229–59: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766628. Source: OSTI; NTIS.

Transport of unprocessed and partly processed well fluids is and has been an important part of the oil and gas industry. Although the technology has been widely used there is still a need for better knowledge and understanding of multiphase flow phenomena and problems associated with multiphase transport in order to achieve a continued reduction in cost for future field developments. Multiphase transport has a number of intrinsic problems. The main problems cover liquid accumulation and flow transients, corrosion and erosion, hydrate formation, and solid precipitation (e.g. wax, asphaltenes). The present paper discusses the problems in terms of experience and further development. 5 figs.

14878 (SAND–94-1026) **Structural stability of the Weeks Island oil repository.** Preece, D.S.; Ehgartner, B.L. Sandia National Labs., Albuquerque, NM (United States). Jun 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC04-94AL85000. Order Number DE95008798. Source: OSTI; NTIS; GPO Dep.

A 3-D finite element analysis was performed to evaluate the stability of the SPR upper and lower oil storage levels at Weeks Island. The mechanical analysis predicted stresses and strains from which pillar stability was inferred using a fracture criterion developed from previous testing of Weeks Island salt. This analysis simulated the sequential mining of the two levels and subsequent oil fill of the mine. The predicted subsidence rates compare well to those measured over the past few years. Predicted failure mechanisms agree with observations made at the time the mine was being modified for oil storage. The modeling technique employed here treats an infinite array of pillars and is a reasonable representation of the behavior at the center of the mine. This analysis predicts that the lower level pillars, at the center of the mine, have fractured and their stability at this time is questionable. Localized pillar fracturing is predicted and implies that the mine is entering a phase of continual time dependent deterioration. Continued and expanded monitoring of the facility and development of methods to assess and predict its behavior are more important now than ever.

0230 Properties and Composition

Refer also to citation(s) 14869, 14870, 14871, 14875, 14876

14879 (CONF-941022–Vol.1, pp. 21-28) **The transition of new technology to solve today's problems.** Kamin, R.A. (Naval Air Warfare Center, Trenton, NJ (United States)); Martin, C.J.; Turner, L.M. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Extensive research has been conducted in the development of methods to predict the degradation of F-44 in storage. The Low Pressure Reactor (LPR) has greatly enhanced the stability prediction capabilities necessary to make informed decisions concerning aviation fuel in storage. This technique has in the past been primarily used for research purposes. The Naval Air Warfare Center, Aircraft Division, Trenton, NJ, has used this technique successfully to assist the Defense Fuel Supply Center, Cameron Station, Alexandria, VA, in stability assessments of F-44. The High Performance Liquid Chromatography/Electrochemical Detector (HPLC/EC) antioxidant determination technique has also aided in making stability predictions by establishing the amount of inhibitor currently in the product. This paper will address two case studies in which the above new technology was used to insure the rapid detection and diagnosis of today's field and logistic problems.

14880 (CONF-941022–Vol.1, pp. 43-57) **Behaviour of conductivity improvers in jet fuel.** Dacre, B. (Cranfield Univ., Wiltshire (United Kingdom)); Hetherington, J.I. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract FS 1a/375,1993. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Dangerous accumulation of electrostatic charge can occur due to high speed pumping and microfiltration of fuel. This can be avoided by increasing the electrical conductivity of the fuel using conductivity improver additives. However, marked variations occur in the conductivity response of different fuels when doped to the same level with conductivity improver. This has been attributed to interactions of the conductivity improver with other fuel additives or fuel contaminants. The present work concentrates on the effects of fuel contaminants, in particular polar compounds, on the performance of the conductivity improver. Conductivity is the fuel property of prime interest. The conductivity response of model systems of the conductivity improver STADIS 450 in dodecane has been measured and the effect on this conductivity of additions of model polar contaminants sodium naphthenate, sodium dodecyl benzene sulphonate, and sodium phenate have been measured. The sodium salts have been found to have a complex effect on the performance of STADIS 450, reducing the conductivity at low concentrations to a minimum value and then increasing the conductivity at high concentrations of sodium salts. This work has focused on characterising this minimum in the conductivity values and on understanding the reason for its occurrence. The effects on the minimum conductivity value of the following parameters are investigated: (a) time, (b) STADIS 450 concentration, (c) sodium salt concentration, (d) mixed sodium salts, (e) experimental method, (f) a phenol, (g) individual components of STADIS 450. The complex conductivity response of the STADIS 450 to sodium salt impurities is discussed in terms of possible inter-molecular interactions.

14881 (CONF-941022–Vol.1, pp. 59-73) **Stadis® 450 in Merox-sweetened jet fuels.** Henry, C.P. (DuPont, Deepwater, NJ (United States)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Stadis® 450 has been used in aviation fuels since 1983, and in many cases is the additive of choice due to conductivity retention of treated fuels during distribution, and other characteristics. In the past several years, manufacture of Shell ASA-3 (the other aviation-approved static dissipator additive) has been discontinued; current stores are being drawn down and for some refiners conversion from ASA-3 to Stadis® 450 is underway. In fuels sweetened by hydrogen-treating, Stadis® 450 performs very well and there are few reported difficulties. Chemically sweetened fuels sometimes contain trace materials not removed by the sweetening process. When treated with Stadis® 450 some of these fuels have exhibited two behaviors which are being addressed: in one case, the formation of a precipitate which disarmed coalescers; in several other cases, reduced conductivity response and loss of conductivity during storage coupled with unusually large effects on the microseparatometer water separation properties. In late 1992, a Coordinating Research Council (CRC) Panel on Coalescer Deactivation was formed to address these problems. The results of DuPont and CRC efforts are discussed, along with actions taken and underway to eliminate these problems.

14882 (CONF-941022–Vol.1, pp. 75-89) **Factors affecting the silver corrosion performance of jet fuel from the Merox process.** Viljoen, C.L. (Sasol Oil R&D (South Africa)); Hietkamp, S.; Marais, B.; Venter, J.J. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The Natref refinery at Sasolburg, South Africa, which is 63,6% owned by Sasol and 36,5% by Total, is producing Jet A-1 fuel at a rate of 80 m^3/h by means of a UOP Merox process. A substantial part of the crude oil slate is made up from crudes which have been stored for considerable times in underground mines. Since the 1970's, Natref has experienced sporadic non-conformance of its treated jet fuel to the silver corrosion (IP 227) test. Various causes and explanations for the sporadic silver corrosion occurrence have been put forward but a direct causal link has remained obscure. The paper addresses these possible causes for silver corrosion and some of the process changes which have been made to alleviate the problem. Emphasis is placed on the most recent approaches which were taken to identify the origin of the sporadic silver corrosion. An inventory of all the potential causes was made, such a bacterial action, elemental sulphur formation in storage, etc. and experiments designed to test the validity of these causes, are discussed. A statistical evaluation which was done of the historical process data over a 2 year period, failed to link the use of mine crudes directly to Ag-corrosion occurrence. However, a correlation between elemental sulphur and H_2S levels in the feed to the Merox reactor and Ag-corrosion was observed. Finally, the outcome of the

experiments are discussed, as well as the conclusions which were reached from the observed results.

14883 (CONF-941022–Vol.1, pp. 91-102) **Autoxidation of jet fuels: Implications for modeling and thermal stability.** Heneghan, S.P. (Univ. of Dayton Research Institute, OH (United States)); Chin, L.P. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract F33615-92-C-2207; Contract F33615-90-C-2033. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The study and modeling of jet fuel thermal deposition is dependent on an understanding of and ability to model the oxidation chemistry. Global modeling of jet fuel oxidation is complicated by several facts. First, liquid jet fuels are hard to heat rapidly and fuels may begin to oxidize during the heat-up phase. Non-isothermal conditions can be accounted for but the evaluation of temperature versus time is difficult. Second, the jet fuels are a mixture of many compounds that may oxidize at different rates. Third, jet fuel oxidation may be autoaccelerating through the decomposition of the oxidation products. Attempts to model the deposition of jet fuels in two different flowing systems showed the inadequacy of a simple two-parameter global Arrhenius oxidation rate constant. Discarding previous assumptions about the form of the global rate constants results in a four parameter model (which accounts for autoacceleration). This paper discusses the source of the rate constant form and the meaning of each parameter. One of these parameters is associated with the pre-exponential of the autoxidation chain length. This value is expected to vary inversely to thermal stability. We calculate the parameters for two different fuels and discuss the implication to thermal and oxidative stability of the fuels. Finally, we discuss the effect of non-Arrhenius behavior on current modeling of deposition efforts.

14884 (CONF-941022–Vol.1, pp. 103-112) **Safe, acceptable anti-microbial strategies for distillate fuels.** Hill, E.C. (ECHA Microbiology Ltd., Cardiff (United Kingdom)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Microbiological fouling, spoilage and corrosion have for years been considered as end-user problems but they have now become endemic up-stream affecting cargoes, tank farms and terminals. Trading agreements to share storage and distribution facilities impose the need to mutually agree antimicrobial strategies which satisfy all health, safety and environmental regulations wherever that fuel is distributed and used. Also agreed must be the infection levels at which antimicrobial action is initiated. Physical decontamination methods are described and the use of biocides discussed in relation to increasing regulatory restrictions.

14885 (CONF-941022–Vol.1, pp. 113-128) **Case study: Use of isothiazolinone and nitro-morpholine biocides to control microbial contamination in diesel and gasoline storage and distribution systems.** Chesneau, H.L.; Passman, F.J.; Daniels, D. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Responding to feed-back from its retail outlet network, a major, vertically integrated petroleum company undertook to diagnose and remediate diesel and gasoline performance problems. Analysis of samples from tanks at refinery, distribution terminal and retail outlet sites established that uncontrolled microbial contamination was rampant throughout the distribution system. The company then developed and instituted a two-phase action plan. During Phase I, all tanks received corrective (shock) biocide treatment preceding mechanical tank cleaning and fuel polishing. An ongoing Phase II program currently includes routine sampling and analysis combined with periodic preventive biocide treatment. This paper describes the initial problem diagnosis, corrective action plan and preventive program; recommending the Phase II program as a model for all companies involved with refining, distribution or retailing gasoline.

14886 (CONF-941022–Vol.1, pp. 129-150) **Harmonisation of microbial sampling and testing methods for distillate fuels.** Hill, G.C. (ECHA Microbiology Ltd., Cardiff (United Kingdom)); Hill, E.C. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Increased incidence of microbial infection in distillate fuels has led to a demand for organisations such as the Institute of Petroleum to propose standards for microbiological quality, based on numbers of viable microbial colony forming units. Variations in quality requirements, and in the spoilage significance of contaminating microbes plus a tendency for temporal and spatial changes in the distribution of microbes, makes such standards difficult to implement. The problem is compounded by a diversity in the procedures employed for sampling and testing for microbial contamination and in the interpretation of the data obtained. The following paper reviews these problems and describes the efforts of The Institute of Petroleum Microbiology Fuels Group to address these issues and in particular to bring about harmonisation of sampling and testing methods. The benefits and drawbacks of available test methods, both laboratory based and on-site, are discussed.

14887 (CONF-941022–Vol.1, pp. 151-171) **Catalase measurement: A new field procedure for rapidly estimating microbial loads in fuels and water-bottoms.** Passman, F.J. (Biodeterioration Control Associates, Inc., Chicago, IL (United States)); Daniels, D.A.; Chesneau, H.F. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Low-grade microbial infections of fuel and fuel systems generally go undetected until they cause major operational problems. Three interdependent factors contribute to this: mis-diagnosis, incorrect or inadequate sampling procedures and perceived complexity of microbiological testing procedures. After discussing the first two issues, this paper describes a rapid field test for estimating microbial loads in fuels and associated water. The test, adapted from a procedure initially developed to measure microbial loads in metal-working fluids, takes advantage of the nearly universal presence of the enzyme catalase in the microbes that contaminated fuel systems. Samples are reacted with a peroxide-based reagent; liberating oxygen gas. The gas generates a pressure-head in a reaction tube. At fifteen minutes, a patented, electronic pressure-sensing device is used to measure that head-space pressure. The authors present both laboratory and field data from fuels and water-bottoms, demonstrating the excellent correlation between traditional viable test data (acquired after 48-72 hours incubation) and catalase test data (acquired after 15 min.-4 hours). We conclude by recommending procedures for developing a failure analysis data-base to enhance our industry's understanding of the relationship between uncontrolled microbial contamination and fuel performance problems.

14888 (CONF-941022–Vol.1, pp. 173-181) **Bacterial contamination of motor gasoline.** Hill, E.C. (ECHA Microbiology Ltd., Cardiff (United Kingdom)); Koenig, J.W.J. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on*

stability and handling of liquid fuels. Volume 1. 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Microbiological growth is found frequently in the bottom of jet fuel, distillate, heavy gasoil and crude oil tanks. Experience shows that traces of water - though theoretically enough for an outbreak of growth - rarely cause problems, because the tank is most probably drained frequently. However when a water table builds up and remains untouched for some time, the likelihood for growth, leading to later operational problems, rapidly increases. Normal paraffin hydrocarbons with c_8-c_{16} chain length appear to be especially vulnerable; in other words the kerosene/jet fuel boiling range is mainly at risk. Heavier hydrocarbon products (diesel, light heating oils and gasoils) however have increasingly seen problems over the last 15-20 years. Lighter products - mainly the gasoline boiling range appear to have been protected from microbial problems over many years. In a laboratory it was of course possible to degrade certain kinds of naphthas and finished gasolines, but those results did not mirror the findings in the field.

14889 (CONF-941022–Vol.1, pp. 183-194) **Biocidal treatment and preservation of liquid fuels.** Siegert, W. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Strict microbiological limit values are the result of damage caused by microorganisms in fuels. With MAR 71, a biocide based on methylenebisoxazolidine, a product is available which has been tested and approved by leading car manufacturers, the mineral oil industry, and NATO. Depending on the degree of microbiological contamination, different decontamination concepts are presented, and recommendations for the treatment of fuels which are contaminated when purchased are given. In order to avoid recontamination, planning principles or the new design of tanks are necessary. The possibility of convenient, economical and regular drainage is a key factor.

14890 (CONF-941022–Vol.1, pp. 211-226) **Mechanism of deposit formation on fuel-wetted metal surfaces.** Stavinoha, L.L. (Southwest Research Institute, San Antonio, TX (United States)); Westbrook, S.R.; McInnis, L.A. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract DAAK70-87-C-0043; Contract DAAK70-92-C-0059. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Experiments were performed in a Single-Tube Heat Exchanger (STHE) apparatus and a Hot Liquid Process Simulator (HLPS) configured and operated to meet Jet Fuel Thermal Oxidation Tester (JFTOT) ASTM D 3241 requirements. The HLPS-JFTOT heater tubes used were 1018 mild steel, 316 stainless steel (SS), 304 stainless steel (SS), and 304 SS tubes coated with aluminum, magnesium, gold, and copper. A low-sulfur Jet A fuel with a breakpoint temperature of 254°C was used to create deposits on the heater tubes at temperatures of 300°C, 340°C, and 380°C. Deposit thickness was measured by dielectric breakdown voltage and Auger ion milling. Pronounced differences between the deposit thickness measuring techniques suggested that both the Auger milling rate and the dielectric strength of the deposit may be affected by deposit morphology/composition (such as metal ions that may have become included in the bulk of the deposit). Carbon burnoff data were obtained as a means of judging the validity of DMD-derived deposit evaluations. ESCA data suggest that the thinnest deposit was on the magnesium-coated test tube. The Scanning Electron Microscope (SEM) photographs showed marked variations in the deposit morphology and the results suggested that surface composition has a significant effect on the mechanism of deposition. The most dramatic effect observed was that the bulk of deposits moved to tube locations of lower temperature as the maximum temperature of the tube was increased from 300° to 380°C, also verified in a single-tube heat exchanger. The results indicate that the deposition rate and quantity at elevated temperatures is not completely temperature dependent, but is limited by the concentration of dissolved oxygen and/or reactive components in the fuel over a temperature range.

14891 (CONF-941022–Vol.1, pp. 227-240) **Effect of high surface area activated carbon on thermal degradation of jet fuel.** Gergova, K. (Pennsylvania State Univ., University Park, PA (United States)); Eser, S.; Arumugam, R.; Schobert, H.H. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. DOE Contract FG22-92PC92104. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Different solid carbons added to jet fuel during thermal stressing cause substantial changes in pyrolytic degradation reactions. Activated carbons, especially high surface area activated carbons were found to be very effective in suppressing solid deposition on metal reactor walls during stressing at high temperatures (425 and 450°C). The high surface area activated carbon PX-21 prevented solid deposition on reactor walls even after 5h at 450°C. The differences seen in the liquid product composition when activated carbon is added indicated that the carbon surfaces affect the degradation reactions. Thermal stressing experiments were carried out on commercial petroleum-derived JPTS jet fuel. We also used n-octane and n-dodecane as model compounds in order to simplify the study of the chemical changes which take place upon activated carbon addition. In separate experiments, the presence of a hydrogen donor, decalin, together with PX-21 was also studied.

14892 (CONF-941022–Vol.1, pp. 241-254) **Development of oxygen scavenger additives for jet fuels.** Beaver, B.D. (Duquesne Univ., Pittsburgh, PA (United States)); Demunshi, R.; Sharief, V.; Tian, D.; Teng, Y. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Our current research program is in response to the US Air Force's FY93 New Initiative entitled "Advanced Fuel Composition and Use." The critical goal of this initiative is to develop aircraft fuels which can operate at supercritical conditions. This is a vital objective since future aircraft designs will transfer much higher heat loads into the fuel as compared with current heat loads. In this paper it is argued that the thermal stability of most jet fuels would be dramatically improved by the efficient in flight-removal of a fuel's dissolved oxygen. It is proposed herein to stabilize the bulk fuel by the addition of an additive which will be judiciously designed and programmed to react with oxygen and produce an innocuous product. It is envisioned that a thermally activated reaction will occur, between the oxygen scavenging additive and dissolved oxygen, in a controlled and directed manner. Consequently formation of insoluble thermal degradation products will be limited. It is believed that successful completion of this project will result in the development of a new type of jet fuel additive which will enable current conventional jet fuels to obtain sufficient thermal stability to function in significantly higher temperature regimes. In addition, it is postulated that the successful development of thermally activated oxygen scavengers will also provide the sub-critical thermal stability necessary for future development of endothermic fuels.

14893 (CONF-941022–Vol.1, pp. 255-273) **Development of thermal stability additive packages for JP-8.** Anderson, S.D. (USAF Wright Lab., Wright-Paterson AFB, OH (United States)); Harrison, W.E. III; Edwards, T.; Morris, R.W.; Shouse, D.T. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Advanced military aircraft use fuel as the primary heat sink to cool engine and airframe components. As the fuel is thermally stressed, thermal oxidative reactions take place that result in the formation of deposits. These deposits degrade aircraft performance and ultimately lead to premature servicing of the affected components. The frequency of these incidents, coupled with the projected cooling requirements for future systems, demonstrates that current thermal stability limits are inadequate. In response to this situation, the United States Air Force (USAF) has embarked on a program to improve thermal stability using specially formulated additive packages. Results indicate that additives offer significant thermal stability improvement. This paper describes the USAF program to develop and deploy an improved JP-8 for fleet-wide use by 1998.

14894 (CONF-941022–Vol.1, pp. 275-289) **Studies of jet fuel additives using the quartz crystal microbalance and pressure monitoring at 140 C.** Zabarnick, S. (Univ. of Dayton Research Institute, OH (United States)); Grinstead, R.R. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract F33615-92-C-2207. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The quartz crystal microbalance (QCM) and pressure monitoring are used for the evaluation of jet fuel additives for the improvement of jet fuel thermal stability. The mechanisms of additive behavior are determined by measuring the time dependent deposition with the QCM and oxidation by pressure measurements. Studies at various additive concentrations permits the determination of optimum additive concentrations. Additive packages made of mixtures of antioxidants, detergent/dispersants, and metal deactivators are shown to yield good improvements in thermal stability over a wide range of jet fuel types.

14895 (CONF-941022–Vol.1, pp. 291-301) **Effect of additives on the formation of insolubles in a jet fuel.** Anderson, S.D. (Wright Lab., Wright-Patterson AFB, OH (United States)); Jones, E.G.; Goss, L.P.; Balster, W.J. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract F33615-90-C-2033. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Dynamic near-isothermal techniques have proven to be valuable in assessing the tendency of aviation fuels to form surface and bulk insolubles under thermal stress. These methods are applied in this study to the investigation of the neat Jet-A fuel POSF-2827 and changes introduced by a series of four candidate additives. In each case fuel is stressed while flowing through a heat exchanger under near-isothermal conditions at 185°C. The average surface deposition rate as a function of stress duration and the quantity of both surface and bulk insolubles have been determined after complete consumption of the dissolved oxygen. The additives, introduced individually, include a common antioxidant, a metal deactivator, a dispersant, and a combination detergent/dispersant. Of the four additives, only the dispersant-types are found to improve fuel thermal stability.

14896 (CONF-941022–Vol.1, pp. 349-361) **The EBV Quality Prediction System (EQPS).** Koenig, J.W.J. (German Strategic Petroleum Reserve, Hamburg (Germany)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

An oil product is said to be ageing, if over time it changes appearance, performance characteristics or environmental properties. Ageing - and so is quality - is a summary term - embracing many influencing factors and observed behaviours. Ageing quality is a function of inherent or added immunity, environmental factors or exposure and of course age. Inherent factors are themselves a function of raw materials from which the product was made and the manufacturing processes used in the refinery.

14897 (CONF-941022–Vol.1, pp. 363-376) **The mathematical approach to EQPS - an expert system for oil quality prediction.** Hartman, J. (Israel Institute for Biological Research, Ness Ziona (Israel)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

EQPS is an expert system for prediction of ageing processes in long term storage of oil products. EQPS contains a data base with detailed information on the user's stored stocks, and a diagnostic Expert System which is used for analysis, evaluation and quality prediction of a given storage site. An extensive body of knowledge and information concerning oil products is included in the program. Petrochemical and petrobiological laboratory test results, source and product processing data, storage conditions, environmental and climatic factors, are all considered in the evaluation.

14898 (CONF-941022–Vol.1, pp. 377-389) **A rapid colorimetric method for predicting the storage stability of middle distillate fuels.** Marshman, S.J. (Defense Research Agency, Surrey (United Kingdom)). USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Present methods used to predict the storage stability of distillate fuels such as ASTM D2274, ASTM D4625, DEF STAN 05-50 Method 40 and in-house methods are very time consuming, taking a minimum of 16 hours. In addition, some of these methods under- or over-predict the storage stability of the test fuel. A rapid colorimetric test for identifying cracked, straight run or hydrofined fuels was reported at the previous Conference. Further work has shown that while a visual appraisal is acceptable for refinery-fresh fuels, colour development may be masked by other coloured compounds in older fuels. Use of a spectrometric finish to the method has extended the scope of the method to include older fuels. The test can be correlated with total sediment from ASTM D4625 (13 weeks at 43°C) over a sediment range of 0-60mg/L. A correlation of 0.94 was obtained for 40 fuels.

14899 (CONF-941022–Vol.1, pp. 391-405) **Thermal stability and filterability of jet fuels containing PDR additives in small-scale tests and realistic rig simulations.** Bauldreay, J.M. (Shell Research, Ltd., Chester (United Kingdom)); Clark, R.H.; Heins, R.J. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

Specification, small-scale and realistic fuel simulation tests have addressed concerns about the impact of pipeline drag reducer (PDR) flow modifying additives on jet fuel handling and performance. A typical PDR additive tended to block filters which were similar to those used in the specification Jet Fuel Thermal Oxidation Tester (JFTOT) and other thermal stability test apparatus. Blockages reduced flow rates and PDR concentrations downstream of the filters. Consequently two PDR additives (A&B) were tested in JFTOT apparatus without the usual in-line pre-filters as part of a Ministry of Defense (MoD) co-ordinated Round Robin exercise. Some fuel/PDR additive combinations caused decreases in JFTOT breakpoints. Effects were additive- (type, concentration and degree of shear) and fuel-dependent; most failures were caused by filter blockages and not by a failing lacquer rating. In further work at Thornton, the thermal stability characteristics of similar fuel/additive combinations have been examined in non-specification tests. In

Flask Oxidation Tests, PDR additives caused no significant increase in the liquid phase oxidation rates of the fuels. Additives were tested in the Single Tube Heat Transfer Rig (STHTR) which duplicates many of the conditions of a heat exchanger element in an engine's fuel supply system. B produced an average two-fold decrease in thermal stability in a Merox fuel; A had no significant effect. In hydrotreated fuel, B reduced the thermal stability up to five-fold. A had little effect below 205°C, while at higher temperatures there may have been a marginal improvement in thermal stability. Again, certain jet fuel/PDR combinations were seen to reduce thermal stability.

14900 (CONF-941022–Vol.1, pp. 407-421) **System evaluation of improved thermal stability jet fuels.** Binns, K.E. (Univ. of Dayton Research Institute, OH (United States)); Dieterle, G.L.; Williams, T. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. Contract F33615-92-C-2207. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

A single-pass, single-tube heat exchanger device called the Phoenix rig and a single-pass, dual-heat exchanger system called the Extended Duration Thermal Stability Test system are specific devices/systems developed for evaluating jet fuel thermal stability. They have been used extensively in the evaluation of various jet fuels and thermal stability additives. The test results have indicated that additives can substantially improve the thermal stability of conventional jet fuels. Relationships of oxygen consumption, residence time, bulk, and wetted wall temperatures on coking deposits that form in the heated tubes have also been investigated.

14901 (CONF-941022–Vol.1, pp. 423-431) **Improvement of test methodology for evaluating diesel fuel stability.** Gutman, M. (Internal Combustion Engines Lab., Haifa (Israel)); Tartakovsky, L.; Kirzhner, Y.; Zvirin, Y.; Luria, D.; Weiss, A.; Shuftan, M. USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management. 1995. From 5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994. In *Proceedings of the 5th international conference on stability and handling of liquid fuels. Volume 1.* 431p. Order Number DE95008873. Source: OSTI; NTIS; GPO Dep.

The storage stability of diesel fuel has been extensively investigated for many years under laboratory conditions. Although continuous efforts have been made to improve testing techniques, there does not yet exist a generally accepted correlation between laboratory methods (such as chemical analysis of the fuel) and actual diesel engine tests. A testing method was developed by the Technion Internal Combustion Engines Laboratory (TICEL), in order to address this problem. The test procedure was designed to simulate diesel engine operation under field conditions. It is based on running a laboratory-modified single cylinder diesel engine for 50 h under cycling operating conditions. The overall rating of each test is based on individual evaluation of the deposits and residue formation in the fuel filter, nozzle body and needle, piston head, piston rings, exhaust valve, and combustion chamber (six parameters). Two methods for analyzing the test results were used: objective, based on measured data, and subjective, based on visual evaluation results of these deposits by a group of experts. Only the residual level in the fuel filter was evaluated quantitatively by measured results. In order to achieve higher accuracy of the method, the test procedure was improved by introducing the measured results of nozzle fouling as an additional objective evaluating (seventh) parameter. This factor is evaluated on the basis of the change in the air flow rate through the nozzle before and after the complete engine test. Other improvements in the method include the use of the nozzle assembly photograph in the test evaluation, and representation of all seven parameters on a continuous scale instead of the discrete scale used anteriorly, in order to achieve higher accuracy. This paper also contains the results obtained by application of this improved fuel stability test for a diesel fuel stored for a five-year period.

14902 (Y/DK–1043) **Determination of halogens in a petroleum product by ion chromatography.** Tucker, H.L. Oak Ridge Y-12 Plant, TN (United States). 15 Jul 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (CONF-950737–1: 36. Rocky Mountain conference on analytical chemistry, Denver, CO (United States), 31 Jul - 5 aug 1995). Order Number DE95002056. Source: OSTI; NTIS; GPO Dep.

A rapid, high-performance ion chromatography (HPIC) method with isocratic separation and the anion self-regenerating suppressor (in the chemical suppression mode, specifically for the determination of fluoride, chloride, bromide, and iodide in a petroleum product) is discussed. This is a proposed new method for a production laboratory within the Analytical Services Organization at the Oak Ridge Y-12 Plant.

03 NATURAL GAS

0302 Reserves, Geology, and Exploration

Refer also to citation(s) 14798, 14801, 14804, 14805, 14806, 14808, 14809, 14810, 14811, 14812, 14813, 16715, 16716, 16717, 16718, 16719, 16720, 16721, 16722, 16728

0303 Drilling, Production, and Processing

Refer also to citation(s) 14798, 14801, 14823, 14828

0304 Products and By-Products

Refer also to citation(s) 15264, 15274

0306 Economic, Industrial, and Business Aspects

Refer also to citation(s) 14790, 14853, 14854, 14855, 14856, 14857, 15376, 15377, 15704, 15705

14903 (INIS-mf–14488) **Chiren Underground Gas Storage - current state and possibilities for extension.** Ivanov, R.; Dimitrov, L. Nauchno-Tekhnicheski Syyuz na Energetitsite, Sofia (Bulgaria). 1994. 7p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627076. Source: OSTI; NTIS (US Sales Only); INIS.

The Chiren underground gas storage is created in a depleted gas bed and is put into operation in 1974. The period 1974-1977 was a stage of experimental compression/production of comparatively small gas quantities. After that trial period the cyclic exploitation of the storage started. The authors describe in detail the current status of the storage and analyse its design and operational data. The annual volumes (in nm^3) of compressed, produced and stored gas for the period 1974-1994 are tabulated. An analysis is also made of the technical state of the drilling rig, the changes in bed pressure and gas volume. The necessity for upgrading and extension of the storage is substantiated and a forecast for changes in gas pressure and volume is given. 4 tabs., 1 fig. (orig.).

14904 (INIS-mf–14500) **Condensing gas boilers for energy efficiency and reduction of CO_2 and NO_x.** Stewardson, E. (Beeston Heating Group Ltd. (United Kingdom)). No corporate text available. 1994. 11p. (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627077. Source: OSTI; NTIS (US Sales Only); INIS.

The objectives of the study are: (1) to demonstrate the effectiveness of condensing gas boiler hot water system in reducing energy costs and pollution; (2) to illustrate the importance of marketing this technology to uninformed end users. The development of condensing boilers in the European Community, the materials used, product designs, key performance measures, and the types of applications suited to these products are outlined. Using calculations from a body of work produced by the Chartered Institute of Building Service Engineers in Britain, it is demonstrated how seasonal

efficiency differs from combustion efficiency, and how the added capital cost for these boilers may be recovered within an acceptable commercial pay back period from fuel cost savings. Applying current NO_x and CO_2 information from a body of the CE Technical Committees, the author show how these products can reduce pollution levels both from CO_2 and NO_x. An example of marketing these products to a largely uninformed end user customer market is cited. 2 refs., 3 tabs., 12 figs. (orig.).

14905 (NEI-NO–504) **What is the cost of supply.** Commichau, A. (Mobil Erdgas-Erdoel GmbH, Hamburg (Germany)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–11: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766580. Source: OSTI; NTIS; INIS.

The conference paper discusses the cost of natural gas supply in Europe. The gas consumption has tripled over the last 20 years, and another 50-80% growth is expected for the following two decades despite a more or less stagnant total energy consumption and the introduction of a CO_2 tax to curb the greenhouse effect. Topics are as follow: European natural gas supply; European supply regions; cost of new pipeline gas to Europe; cost of new LNG to Europe; European gas imports - cost of incremental supplies.

0307 Waste Management

Refer also to citation(s) 14865

0308 Environmental Aspects

Refer also to citation(s) 14904

0310 Legislation and Regulations

Refer also to citation(s) 14868, 15707

0320 Transport, Handling, and Storage

14906 (NEI-DK–1947) **Natural gas distribution. Master plan for Kaunas City, Lithuania.** Carl Bro Energy A/S, Glostrup (Denmark); Hovedstadsregionens Naturgas I/S, Soeborg (Denmark); Carl Bro Gruppen, Glostrup (Denmark). Mar 1995. 311p. Contract IMOe-906. Order Number DE95772354. Source: OSTI; NTIS.

This master plan from a Danish firm for the distribution of natural gas in the city of Kaunas, Lithuania is presented in the form of a short summary followed by a collection of detailed technical notes and data. It is noted that the pipes comprising the distribution network are in a state of advanced corrosion which promotes a degree of uncertainty with regard to planning. Economical calculations indicated a clear benefit from renovation of the cathodic protection system. There is a plan for the extension of gas sales in Kaunas. Training courses for Lithuanian technicians have been carried out in Copenhagen (Denmark). Institutional, market, technical and financial aspects of the project are dealt with in the series of technical notes. General conclusions and recommendations are given on the subject of the possible renovation of the natural gas distribution system in Lithuania. (AB) (2 maps.)

14907 (SVF–533) **Polyethylene pipes for propane distribution.** Viebke, J. (Studsvik Material AB, Nykoeping (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 70p. (In Swedish). Project Vaermeforsk-G1-109. (STUDSVIK-M–94-141). Order Number DE95766641. Source: OSTI; NTIS.

The work was initiated in order to define the critical factors for distribution of propane in polyethylene pipes. The project has included pressure testing of MDPE-pipes with gaseous propane as internal medium at 60, 80, 95 and 105 degrees C, pressure testing with liquefied propane as internal medium at 20 and 40 degrees C, and pressure testing with oil residue as internal medium at 20 and 40 degrees C. A pressure testing equipment for pressure testing with gaseous propane at elevated temperatures has been constructed. Hydrostatic pressure testing, i.e. pressure testing with water as the internal medium, has been performed at 20, 40, 60, 80, 95 and 105 degrees C. OIT (oxidation induction time), crystallinity and TG (thermal gravimetry)-analyses have been performed and oil residue from a propane distribution system in service has been obtained and analysed. Scanning electron microscopy and X-ray microanalysis have been performed. The results from the pressure testing at 60, 80, 95 and 105 degrees C show that the durability of the MDPE-pipes toward gaseous propane is good. The results from the pressure testing with liquefied propane at 20 and 40 degrees C show that the Stage I-level of the MDPE-pipes is lowered with approximately 30%. In practice, this entails that condensation of propane in MDPE pipeline systems should be avoided, since this yields a vast decrease in the strength of the pipes. 10 refs, 23 figs, 26 tabs

0330 Properties and Composition

Refer also to citation(s) 16180

0340 Combustion

Refer also to citation(s) 14757, 14776, 14777, 14778, 14779, 14781, 14782, 14783, 14784, 14785, 16302, 16491

14908 (ANL/ES/CP–85388) **New Technology for America's Electric Power Industry. Emissions reduction in gas turbines.** Argonne National Lab., IL (United States). [1995]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941210–11: Power generation conference, Orlando, FL (United States), 7-9 Dec 1994). Order Number DE95008402. Source: OSTI; NTIS; GPO Dep.

Argonne National Laboratory is examining alternatives to straight natural gas firing. Research has shown that the addition of certain catalytic agents, such as in hydrogen co-firing, shows promise. When hydrogen co-firing is used in tandem with steam injection, a decrease in both CO and NO_x emissions has been observed. In-process hydrogen production and premixing with the natural gas fuel are also being explored.

14909 (NEI-DK–1875) **Natural gas fired small size heating stations.** Dansk Gasteknisk Center A/S, Hoersholm (Denmark). 1994. 43p. Contract IMOe-639. Order Number DE95766434. Source: OSTI; NTIS.

A training 2-day course in natural gas fueled small heating plants was held by the Danish Gas Technology Centre. Operation, control, safety regulations, flue gas cleaning and pollution abatement as well as the economic factors of natural gas use were discussed. (au)

04 OIL SHALES AND TAR SANDS

0440 Combustion

Refer also to citation(s) 15250

05 NUCLEAR FUELS

0501 Reserves, Exploration, and Mining

Refer also to citation(s) 16148, 16536

14910 (PNC-TN–7510-94-006) **Uranium resources, production and demand 1993.** Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Oct 1994. 341p. Translated from Uranium Resources, Production and Demand 1993 (OECD/NEA-IAEA). (In Japanese). Order Number DE95768240. Source: OSTI; NTIS; INIS.

This book is the Japanese edition of 'Uranium Resources, Production and Demand, 1993' published by OECD/NEA-IAEA in 1994. It contains data on uranium exploration activities, resources and production for about 50 countries. (K.I.).

0504 Feed Processing

Refer also to citation(s) 15140, 15141, 16187, 16191

14911 (CEA-CONF–11920) **Study and modelling of UF_6-UO_2 conversion kiln.** Lacombe, S. (CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. Stockage Dechets); Perrais, C.; Michaille, P.; Hobbes, P.; Maury, C. CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. Stockage Dechets. 1994. 2p. (CONF-940920–: 13. international symposium on chemical reaction engineering, Baltimore, MD (United States), 25 Sep 1994). Order Number DE95626374. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 figs., 4 refs. KILNS/conversion; URANIUM HEXAFLUORIDE/uranium dioxide; FLOW MODELS; FURNACES; KILNS; CONVERSION; KRYPTON 79; NUCLEAR FUELS; URANIUM 235

0505 Uranium Enrichment

Refer also to citation(s) 15200

14912 (ORNL/TM–12867) **Network user's guide.** McGrady, P.W. Oak Ridge National Lab., TN (United States). Dec 1994. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009185. Source: OSTI; NTIS; INIS; GPO Dep.

NETWORK is a FORTRAN code used to model process flow systems in the gaseous diffusion plants at Portsmouth, Ohio and Paducah, Kentucky, operated by the United States Enrichment Corporation. It can handle a wide range of components and several different types of controllers. NETWORK can be run in either a steady-state mode or a transient mode. In the transient mode many different types of perturbations may be modeled. It is currently being used to model taking a cell off-stream in a gaseous diffusion plant. A brief description of the code is given, and process equipment models and input data are discussed.

0507 Fuels Production and Properties

Refer also to citation(s) 15220, 15582, 15904, 16130, 16137

14913 (HW–77018) **[Travel to England for Sixth US-UK Information Exchange on Feed Materials.] Foreign trip report, November 23–December 9, 1962.** Minor, J.E. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 2 Jan 1963. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010022. Source: OSTI; NTIS; GPO Dep.

This report describes foreign travel by J.E. Minor, Manager-Metal Fabrication Development Operation, Hanford Laboratories, General Electric Company, Richland Washington. This travel occurred during the period November 23–December 9, 1962, the primary purpose being participation in the Sixth US-UK Information Exchange on Feed Materials. The information exchange was the sixth of its kind, and the first to include US Reactor Site personnel in discussions in England. The meeting was held to review fuel fabrication processes and development work.

0508 Spent Fuels Reprocessing

Refer also to citation(s) 14926, 14956, 15056, 15151, 16256, 17431

14914 (LA–12923-MS) **Authentication of reprocessing plant safeguards data through correlation analysis.** Burr, T.L.; Wangen, L.E.; Mullen, M.F. Los Alamos National Lab., NM (United States). Apr 1995. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009022. Source: OSTI; NTIS; INIS; GPO Dep.

This report investigates the feasibility and benefits of two new approaches to the analysis of safeguards data from reprocessing plants. Both approaches involve some level of plant modeling. All models involve some form of mass balance, either applied in the usual way that leads to material balances for individual process vessels at discrete times or applied by accounting for pipe flow rates that leads to material balances for individual process vessels at continuous times. In the first case, material balances are computed after each tank-to-tank transfer. In the second case, material balances can be computed at any desired time. The two approaches can be described as follows. The first approach considers the application of a new multivariate sequential test. The test statistic is a scalar, but the monitored residual is a vector. The second approach considers the application of recent nonlinear time series methods for the purpose of empirically building a model for the expected magnitude of a material balance or other scalar variable. Although the report restricts attention to monitoring scalar time series, the methodology can be extended to vector time series.

14915 (WSRC-MS–94-0605) **Wall thinning acceptance criteria for degraded carbon steel piping systems using FAD methodology.** Lam, P.S.; Gupta, N.K. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950740–4: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95005887. Source: OSTI; NTIS; GPO Dep.

As part of the structural integrity assessment for Savannah River Site (SRS) piping systems, an acceptance criteria methodology for minimum pipe wall thickness has been developed for carbon steel piping. If a measured pipe thickness during inspection cannot meet the 87.5% of the nominal wall thickness specified in the ASME Code Case N-480, the acceptance criteria must be invoked. For a particular pipe, the larger of the two minimum thickness values obtained from the code stress check and the CEGB-R6 Failure Assessment Diagram (FAD) methodology is the minimum wall thickness for the acceptance criteria. The code stress check is based on the ASME/ANSI B31.1 Code, ASME Code Case N-480, and the SRS reactor restart criteria. The pipe wall thickness is calculated from the code equations and the applied loads. In fracture analysis, three types of axial and circumferential flaws are assumed to exist in the pipes based on the weld defects found in service history. For each flaw configuration, the stress intensity factors and the limit load solutions are calculated. These quantities are input to FAD to solve for the corresponding wall thickness required for the pipe to sustain the postulated flaws and to meet ASME safety margins under the applied loads.

0509 Transport, Handling, and Storage

Refer also to citation(s) 14959, 14992, 15019, 15068, 15071, 15072, 15191, 15452, 15646, 17334

14916 (ANL/FO/CP–84381) **Simplified risk assessment for transporting ATR spent fuel within the INEL.** Franklin, E.M. (Argonne National Lab., Idaho Falls, ID (United States)); Courtney, J.C.; Roesener, R.A. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–36: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009900. Source: OSTI; NTIS; INIS; GPO Dep.

Interest in characterizing the condition of stored spent fuels has generated the need to move spent fuels to hot cell facilities within the Idaho National Engineering Laboratory (INEL). A simplified probabilistic risk assessment (SPRA) and an evaluation of the radiological consequences in the event of an accident are discussed and applied to on-site Advanced Test Reactor (AYR) spent fuel shipments. Reported accident probabilities between 10^{-4} and 10^{-6} and low radiological consequences, affords this, and other spent fuel characterization efforts, an additional option to move spent fuels within the INEL.

14917 (ANL/TD/CP–84441) **Pyrophoricity of uranium in long-term storage environments.** Solbrig, C.W.; Krsul, J.R.; Olsen, D.N. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–34: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009902. Source: OSTI; NTIS; INIS; GPO Dep.

A corrosion cycle for uranium is postulated which can be used to assess whether a given storage situation might produce fire hazards and/or continual uranium corrosion. A significant reaction rate of uranium and moisture occurs at room temperature which produces uranium oxide and hydrogen. If the hydrogen cannot escape, it will react slowly with uranium to form uranium hydride. The hydride is pyrophoric at room temperature when exposed to air. Either the hydrogen or the hydride can produce a dangerous situation as demonstrated by two different incidents described here. Long-term corrosion will occur even if the normal precautions are taken as is demonstrated by the long-term storage of stainless steel clad uranium fuel plates. The major initiator of these problems is attributed to any moisture condensed on the metal or any brought in by the cover gas. The postulated corrosion cycle is used to suggest ways to circumvent these problems.

14918 (CONF-9304128–, pp. J.14-J.16) **The Westinghouse Idaho Nuclear Company (WINCO) ALARA Program.** Reavis, R. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

WINCO operates the Idaho Chemical Processing Plant (ICPP) for the Department of Energy. Since 1953 the ICPP has recovered uranium from spent nuclear fuel assemblies, largely from government owned reactors. However in 1992, the mission of the ICPP changed to one of fuel receipt, fuel storage and waste management. WINCO employs approximately 1800 personnel at the ICPP, of which approximately 1000 routinely enter radiation areas. WINCO also contracts construction to perform a variety of radiological work activities. The ALARA committee is made up of representatives from various departments involved in radiological work activities, including the work force. During this presentation, the responsibilities of the ALARA Committee are identified.

14919 (CONF-950216–119) **Summary of needs assessment for long-term planning of DOE's transportation and packaging activities.** Pope, R.B. (Oak Ridge National Lab., TN (United States)); Turi, G.; Brancato, R.; Blalock, L.; Merrill, O. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95010285. Source: OSTI; NTIS; INIS; GPO Dep.

DOE has performed a global scoping of packaging and transportation needs to prepare for changes in its transportation requirements in the future. This needs assessment, initiated in mid-August 1994 and completed in December 1994, provides a global took at the types and quantities of materials DOE will be required to package and transport from 1995 through 2030. Results of the assessment indicate that DOE can expect a rapid increase in the shipment of radioactive and other hazardous materials during the late 1990s and on into the first decades of the 21st century. A significant increase in DOE-related packaging and transportation activities is expected as extensive waste remediation is undertaken at various DOE sites. For example, some 1400 facilities are expected to be transferred to DOE EM for decommissioning, decontamination, or other similar actions. As this occurs, the quantities of hazardous materials destined for long-term storage and/or disposal are expected to grow significantly. DOE must be prepared to accommodate these shipping needs relative to human resources, packaging, systems interfacing, logistics, regulatory compliance, training, and operations. Results of the needs assessment are expected to be used by DOE planners and managers to guide future efforts. Summary results of the Transportation Needs Assessment are outlined, presenting the findings in terms of both projected growth of shipping patterns and resulting identified human resource, software, and hardware needs–and their associated costs–that DOE needs to prepare to satisfy in the future.

14920 (DOE/RW–0462) **Notice of inquiry on waste acceptance issues: Response summary.** USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States). Mar 1995. 119p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009036. Source: OSTI; NTIS; INIS; GPO Dep.

On May 25, 1994, the Department of Energy published a Notice of Inquiry on Waste Acceptance Issues in the Federal Register. Through this Notice of Inquiry, the Department sought to implement the Secretary's initiative to explore with affected parties various options and methods for sharing the costs related to the financial burden associated with continued on-site storage by eliciting the views of affected parties on: (1) The Department's preliminary view that it does not have a statutory obligation to begin accepting spent nuclear fuel in 1998 in the absence of an operational repository or other suitable storage facility constructed under the Nuclear Waste Policy Act of 1982, as amended; (2) The need for an interim, away-from-reactor storage facility prior to repository operations; and (3) Options for offsetting, through the Nuclear Waste Fund, a portion of the financial burden that may be incurred by utilities in continuing to store spent nuclear fuel at reactor sites beyond 1998. The Department received a total of 1,111 responses representing 1,476 signatories to this Notice of Inquiry. The responses included submittals from utilities (38 responses); public utility/service commissions and utility regulators (26 responses); Federal, state, and local governments, agencies, and representatives (23 responses); industry and companies (30 responses); public interest groups and other organizations (19 responses); and members of the general public (975 responses).

14921 (IAEA-TECDOC–786) **Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.** International Atomic Energy Agency, Vienna (Austria). Jan 1995. 92p. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

Irradiated fuel from research and test reactors has been stored at various facilities for several decades. As these facilities age and approach or exceed their original design lifetimes, there is mounting concern about closure of the fuel cycle and about the integrity of ageing fuels from the materials point of view as well as some concern about the loss of self-protection of the fuels as their activity decays. It is clear that an international effort is necessary to give these problems sufficient exposure and to ensure that work begins on appropriate solutions. To obtain an overall picture of the size and extent of these problems, an Advisory Group Meeting on Storage Experience with Spent Fuel from Research Reactors was convened in Vienna 5-8 July 1993, and attended by twelve participants and three observers representing thirteen different countries. These proceedings contain the country reports presented at the meeting. Refs, figs and tabs.

14922 (IAEA-TECDOC–786, pp. 11-14) **Spent fuel storage at the ASTRA reactor, Seibersdorf.** Nedelik, A. (Oesterreichisches Forschungszentrum Seibersdorf GmbH, Vienna (Austria)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

The storage of spent fuel at the ASTRA research reactor, Seibersdorf, Austria, is described as well as some of the problems that have been encountered. Of special interest is the description of the adaptation of a hot cell for the interim storage of spent fuel. (author). 4 figs, 1 tab.

14923 (IAEA-TECDOC–786, pp. 15-30) **Storage experience with fuel from research reactors in Belgium.** Gubel, P. (CEN/SCK, Mol (Belgium)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

Experiences and problems with the storage of irradiated fuel at research reactors in Belgium are described. In particular, the interim storage of spent fuel elements at the BR2 reactor in Mol, which has posed special problems, is described in some detail in the Annex to this paper. (author). 5 refs, 12 figs, 1 tab.

14924 (IAEA-TECDOC–786, pp. 31-32) **Storage experience with fuel from research reactors in Denmark.** Qvist, J. (Reactor DR-3, Roskilde (Denmark)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

The DR 3 reactor at Riso National Laboratory is a 10 MW PLUTO type MTR. The reactor has been operating for more than three decades and the back-end of the fuel cycle is based upon reprocessing. Storage before shipment has up to now taken place in a pool with controlled water chemistry. The lapse of reprocessing unexpectedly declared by US DOE in 1988 has caused considerable problems. First, old casks has had to be put into use as dry storage and, secondly, a dry storage facility had to be constructed. The latter is expected to be operational by the end of 1993. (author).

14925 (IAEA-TECDOC–786, pp. 33-46) **Spent fuel storage experience at the ET-RR-1 reactor in Egypt.** Saad, E.A. (Nuclear Research Centre, Inshas (Egypt). Reactor Dept.); Elsherbiny, E.M.; Sobhy, M.; Mahmoud, S.I. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

The pool type spent fuel storage is considered to be the most appropriate and flexible system. Recently, the pools which were designed to be short term storage for spent fuel became quasi-permanent storage because of the recent prohibition on reprocessing of spent fuel. One of the most economical ways to accommodate more spent fuel is to improve the efficiency of these stores making sure that the system remains subcritical as well as verifying other safety aspects. The effective multiplication factor of any array of fuel assemblies should be less than 0.95. The subcriticality in spent fuel storage facility is assured by adjusting geometric separation of the assemblies and also neutron poisons can be added. The results showed that it is quite possible to increase the capacity of Inshas reactor spent fuel store from 60 to 90 fuel elements maintaining well accepted safety margin by adding a second rack. The calculations indicated also that it is possible to store at least 50 fuel assemblies in an internal storage surrounding the ETRR-1 core. This internal storage will increase the excess reactivity of the reactor by 0.00385. This increment in the reactivity can be compensated easily by either reducing the fuel inventory in the core or by using the rod absorbers of the reactor control system. Moreover, there are attempts to construct a compact spent fuel store (wet or dry) of capacity twice that of the present storage. This capability can be increased using fixed neutron poisons. (author). 12 refs, 11 figs.

14926 (IAEA-TECDOC–786, pp. 47-52) **Storage experience with fuel from research reactors in France.** Hagemann, M. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

Interim storage of spent fuel at research reactors in France together with French policy based on reprocessing is described. Back-up solutions for spent fuel storage problems involving the PEGASE and CASCAD facilities are outlined. (author). 3 figs, 3 tabs.

14927 (IAEA-TECDOC–786, pp. 53-58) **Status of the back end of the fuel cycle for research reactors in Germany.** Krull, W. (GKSS Forschungszentrum Geesthacht GmbH, Geesthacht (Germany)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

The spent fuel situation at research reactors in Germany is outlined together with legal restrictions imposed by the German Atomic Energy Act. Possible solutions including reprocessing in the United Kingdom or France, return of US origin fuel and a homegrown German solution are discussed. (author). 1 fig., 1 tab.

14928 (IAEA-TECDOC–786, pp. 59-63) **Storage experience in Hungary with fuel from research reactors.** Gado, J. (KFKI Atomic Research Inst., Budapest (Hungary)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

In Hungary several critical assemblies, a training reactor and a research reactor have been in operation. The fuel used in the research and training reactors are of Soviet origin. Though spent fuel storage experience is fairly good, medium and long term storage solutions are needed. (author).

14929 (IAEA-TECDOC–786, pp. 65) **Experience with underwater storage of spent fuel from research reactors in India.** Sharma, S.K. (Bhabha Atomic Research Centre, Bombay (India)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

Over 30 years of experience in the storage of irradiated fuel from research reactors exists at the Bhabha Atomic Research Centre. Experience with wet storage of metallic fuel is dealt with in this presentation. (Abstract only).

14930 (IAEA-TECDOC–786, pp. 67-73) **Present status of spent fuels in Japanese research reactors.** Sumita, K. (Osaka Univ., Osaka (Japan). Dept. of Nuclear Energy); Kodaira, T. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

Spent fuel storage at research reactors in Japan is described in outline. Reactors KUR, JRR-2 and JRR-4 have enough storage capacity at present but an increase of the storage capacity at JRR-3M and JMTR by reracking is under consideration. For the long term some consideration is being given to dry storage in casks to prevent fuel cladding corrosion. (author). 3 tabs.

14931 (IAEA-TECDOC–786, pp. 75-81) **The problems of treatment of irradiated fuel at Russian research reactors.** Arkhanguelskij, N.V. (Ministry of Atomic Energy of the Russian Federation, Moscow (Russian Federation)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes the problems of safety during the storage and transportation of spent fuel from Russian research reactors. Many research reactors continue to operate in Russia at THE present time. They use many different types of fuel elements and assemblies. The questions of safety during storage and transportation of spent fuel from research reactors is considered in Russian documents on the safety of research reactors. The main features of these documents are described in this report. Three stages of the storage and transportation of spent fuel are discussed: the temporary storage in the pool or in the vessel; the storage in the repository on the territory of the institutes; and the transportation of the fuel to the reprocessing plant. The future plans provide for the solution of the problems of transportation and reprocessing of all types of fuel assemblies which are used in Russian research reactors and experimental facilities. Also, there is an intention to continue the work on reducing the enrichment of the fuel for research reactors and to change the fuel composition from uranium dioxide in an aluminium matrix to uranium silicide in aluminium matrix. (author). 4 refs, 4 figs, 1 tab.

14932 (IAEA-TECDOC–786, pp. 83-90) **Fuel storage handling at the R2 reactor at Studsvik.** Jonsson, E.B. (Studsvik Nuclear, Nykoeping (Sweden)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9307217–: Advisory group meeting on experience with spent fuel storage at research and test reactors, Vienna (Austria), 5-8 Jul 1993). In *Experience with spent fuel storage at research and test reactors. Proceedings of an advisory group meeting held in Vienna, 5-8 July 1993.* 92p. Order Number DE95626768. Source: OSTI; NTIS (US Sales Only); INIS.

The Swedish 50 MW(th) high flux reactor R2 has been in operation since 1960. The reactor has during these 33 years used more than 1300 fuel assemblies. The HEU (high enriched uranium) fuel is gradually replaced by LEU (low enriched uranium) fuel. From the operating point of view the same rules on transport and storage are valid for both HEU and LEU assemblies. Before, during and after irradiation the fuel assemblies are stored in a fresh assembly dry storage vault, in the reactor pool and core and in an intermediate storage pool outside the containment, respectively. Final disposal of the fuel assemblies has been through reprocessing by USDOE. It is essential for a safe storage of the assemblies that they are: kept in a critically safe configuration; effectively separated from the public (radiation protection); kept under good ageing conditions, easily safeguard controlled. (author). 6 figs.

14933 (IAEA-TSRA–2) **Transport safety research abstracts. No. 2. Information on research recently concluded and in progress.** International Atomic Energy Agency, Vienna (Austria). Sep 1994. 86p. Order Number DE95626769. Source: OSTI; NTIS (US Sales Only); INIS.

Transport Safety Research Abstracts (TSRA) was first published by the IAEA in 1991 as a means of disseminating information on research in radioactive material transport. This second edition utilizes International Nuclear Information System (INIS) protocol for data processing and report preparation for a research-in-progress database established by the IAEA's Division of Scientific and Technical Information. INIS subject categories and descriptors are included in the information about each project.

14934 (K/TCD–1057) **Preliminary investigation of steel compatibility with potential materials of construction for UF6 cylinder chocks.** Pawel, S.J.; Ziehlke, K.T.; Swindeman, C.J. Oak Ridge K-25 Site, TN (United States). Dec 1992. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009569. Source: OSTI; NTIS; GPO Dep.

A set of compatibility experiments was performed to assess corrosion susceptibility of mild steel in long term contact with UF_6 cylinder chocking materials and the atmosphere. Chock materials considered included concrete, pressure-treated wood, and creosote-treated wood. Immersion tests (panels partially submerged, 1000 h, 38 C), resistance probe measurements (600 h, ambient), and cyclic polarization tests on steel in leachate solutions generated from each chock material were performed. Results indicate that the long term corrosion susceptibility of mild steel in contact with concrete and the atmosphere is at least the equivalent of – and under some conditions superior to – that for steel in contact with pressure-treated or creosote-treated wood. No corrosion-related limitation for concrete chocks for long term support of mild steel UF_6 cylinders was identified.

14935 (NUREG/CR–5625) **Technical support for a proposed decay heat guide using SAS2H/ORIGEN-S data.** Hermann, O.W. (Oak Ridge National Lab., TN (United States)); Parks, C.V.; Renier, J.P. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Oak Ridge National Lab., TN (United States). Sep 1994. 116p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL–6698). Source: OSTI; NTIS; INIS.

Major revisions are proposed to the current US Nuclear Regulatory Commission decay heat rate guide entitled "Regulatory Guide 3.54, Spent Fuel Heat Generation in an Independent Spent Fuel Storage Installation," using a new data base produced by the SAS2H analysis sequence of the SCALE-4 system. The data base for the proposed guide revision has been significantly improved by increasing the number and range of parameters that generally characterize pressurized-water-reactor (PWR) and boiling-water-reactor (BWR) spent fuel assemblies. Using generic PWR and BWR assembly models, calculations were performed with each model for six different burnups at each of three separate specific powers to produce heat rates at 20 cooling times in the range of 1 to 110 y. The proposed procedure specifies proper interpolation formulae for the tabulated heat generation rates. Adjustment formulae for the interpolated values are provided to account for differences in initial ^{235}U enrichment and changes in the specific power of a cycle from the average value. Finally, safety factor formulae were derived as a function of burnup, cooling time, and type of reactor. The proposed guide revision was designed to be easier to use. Also, the complete data base and guide procedure is incorporated into an interactive code called LWRARC which can be executed on a personal computer. The report shows adequate comparisons of heat rates computed by SAS2H/ORIGEN-S and measurements for 10 BWR and 10 PWR fuel assemblies. The average differences of the computed minus the measured heat rates of fuel assemblies were $-07 \pm 2.6\%$ for the BWR and $1.5 \pm 1.3\%$ for the PWR. In addition, a detailed analysis of the proposed procedure indicated the method and equations to be valid.

14936 (SAND–95-0143C) **Research and Development Program for transportation packagings at Sandia National Laboratories.** Hohnstreiter, G.F.; Sorenson, K.B. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950646–6: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95006819. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains information about the research and development programs dealing with waste transport at Sandia National Laboratories. This paper discusses topics such as: Why new packaging is needed; analytical methodologies and design codes;evaluation of packaging components; materials characterization; creative packaging concepts; packaging engineering and analysis; testing; and certification support.

14937 (STUK-YTO-TR–55) **SFAT geometry verification measurements at the TVO KPA-STORE. Interim report on Task FIN A563 of the Finnish Support Programme to IAEA Safeguards.** Tiitta, A.; Kaita, K.; Tarvainen, M. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Jul 1993. 26p. Order Number DE95627933. Source: OSTI; NTIS; INIS.

Experiments made for the confirmation of the measurement geometry of the Spent Fuel Attribute Tester (SFAT), performed in December 1992, are reported and analysed. The measurement geometry to be chosen for a commercial prototype can be confirmed to be close enough to the optimum and to give a satisfactory signal-to-noise ratio. The problems encountered during the determination of the signal-to-noise ratio of Cs^{137} peaks rise to recommendation of developing new algorithms for processing NaI(Tl) detector spectra. (orig.) (7 refs., 11 figs., 5 tabs.).

14938 (WHC-SA–2491) **Packaging and transportation of radioactive liquid at the U.S. Department of Energy Hanford Site.** Smith, R.J. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950426–1: 3. international conference on nuclear engineering, Kyoto (Japan), 23-27 Apr 1995). Order Number DE95007791. Source: OSTI; NTIS; INIS; GPO Dep.

Beginning in the 1940's, radioactive liquid waste has been generated at the US Department of Energy (DOE) Hanford Site as a result of defense material production. The liquid waste is currently stored in 177 underground storage tanks. As part of the tank remediation efforts, Type B quantity packagings for the transport of large volumes of radioactive liquids are required. There are very few Type B liquid packagings in existence because of the rarity of large-volume radioactive liquid payloads in the commercial nuclear industry. Development of aboveground transport systems for large volumes of radioactive liquids involves institutional, economic, and technical issues. Although liquid shipments have taken place under DOE-approved controlled conditions within the boundaries of the Hanford Site for many years, offsite shipment requires compliance with DOE, US Nuclear Regulatory Commission (NRC), and US Department of Transportation (DOT) directives and regulations. At the present time, no domestic DOE nor NRC-certified Type B packagings with the appropriate level of shielding are available for DOT-compliant transport of radioactive liquids in bulk volumes. This paper will provide technical details regarding current methods used to transport such liquids on and off the Hanford Site, and will provide a status of packaging development programs for future liquid shipments.

14939 (WHC-SD-CP-SAR–021-Vol.1) **Plutonium finishing plant final safety analysis report. Volume 1.** Shapley, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 1327p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009101. Source: OSTI; NTIS; INIS; GPO Dep.

This Final Safety Analysis Report was approved by DOE-HQ on January 6, 1995. It replaces 14 older PFP safety analysis and incorporates several Safety Assessment Documents prepared in 1993 and 1994. A draft of this document dated January 1991 has been circulated – all pages of the approved Revision 0 are dated January 1995. Additionally, approval of this document by DOE-HQ closes an Unreviewed Safety Question related to 232-Z Incinerator Building that was identified in August, 1994. This document and its companion document, WHC-SD-CP-OSR-010, "Plutonium Finishing Plant Operational Safety Requirements," are the primary references for definition of the Plutonium Finishing Plant (PFP) safety authorization basis.

14940 (WHC-SD-CP-SAR–021-Vol.2) **Plutonium finishing plant final safety analysis report. Volume 2.** Shapley, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 1275p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009102. Source: OSTI; NTIS; INIS; GPO Dep.

This Final Safety Analysis Report was approved by DOE-HQ on January 6, 1995. It replaces 14 older PFP safety analysis and incorporates several Safety Assessment Documents prepared in 1993 and 1994. A draft of this document dated January 1991 has been circulated – all pages of the approved Revision 0 are dated January 1995. Additionally, approval of this document by DOE-HQ closes an Unreviewed Safety Question related to 232-Z Incinerator Building that was identified in August, 1994. This document and its companion document, WHC-SD-CP-OSR-010, "Plutonium Finishing Plant Operational Safety Requirements," are the primary references for definition of the Plutonium Finishing Plant (PFP) safety authorization basis.

14941 (WHC-SD-SNF-CSER–001-Rev.1) **Basis for criticality category B firefighting designation for K Basins. Revision 1.** Jensen, M.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010055. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document analyzes the various fissile material configurations in the 105-K East and K West fuel storage basins to determine the proper firefighting category. Firefighting categories are assigned to fissionable material facilities to provide guidance to firefighters in the allowable uses of water and other extinguishing materials to prevent inadvertent rearrangement of fissile materials or addition of neutron moderators which could lead to a criticality. This document concludes the appropriate category is B, which does not impose any restrictions on the use of water for firefighting purposes.

14942 (WHC-SD-SNF-DR–001) **Design support document for the K Basins Vertical Fuel Handling Tools.** Bridges, A.E. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008805. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the design support information for the Vertical Fuel Handling Tools, developed for the removal of N Reactor fuel elements from their storage canisters in the K Basins storage pool and insertion into the Single Fuel Element Can for subsequent shipment to a Hot Cell for examination. Examination of these N Reactor fuel elements is part of the overall characterization effort. These new hand tools are required since previous fuel movement has involved grasping the fuel in a horizontal position. These tools are required to lift an element vertically from the storage canister. Additionally, a Mark II storage canister Lip Seal Protector was designed and fabricated for use during fuel retrieval. This device was required to prevent damage to the canister lip should a fuel element accidentally be dropped during its retrieval, using the handling tools. Supporting documentation for this device is included in this document.

14943 (WHC-SD-SNF-SM–002) **Choices of canisters and elements for the first fuel shipment from K West Basin.** Makenas, B.J. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008806. Source: OSTI; NTIS; INIS; GPO Dep.

Twenty-two canisters (10 prime and 12 backup candidates) in the K West Basin have been identified as containing fuel which, when examined, will satisfy the Data Quality Objectives for the first fuel shipment from this basin. These were chosen as meeting criteria such as containing relatively long fuel elements, locking bar integrity, and the availability of gas/liquid interface level measurements for associated canister gas traps. Two canisters were identified as having reported broken fuel on initial loading. Usage and interpretation of canister cesium concentration measurements have also been established and levels of maximum and minimum acceptable cesium concentration (from a data optimization point of view) for decapping have been determined although other operational cesium limits may also apply. Criteria for picking particular elements, once a canister is opened, are reviewed in this document. A pristine, a slightly damaged, and a badly damaged element are desired. The latter includes elements with end caps removed but does not include elements which have large amounts of swelling or split cladding that might interfere with handling tools. Finally, operational scenarios have been suggested to aid in the selections of canisters and elements in a way that utilizes anticipated canister gas sampling and leads to a correct and quick choice of elements which will supply the desired data.

14944 (WHC-SD-SQA-CSA–20393) **CSER 95-002: ALARA shielding for IAEA SNM container movement.** Miller, E.M. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008890. Source: OSTI; NTIS; INIS; GPO Dep.

This CSER qualifies use of a 5% borated, lead foil lined polyethylene 1 inch annulus as a bucket and in a small carrier to move sealed containers of plutonium. The containers are Oversize Cans or smaller containing plutonium limited in mass and H/Pu ratio by PFP storage and transportation CPS's. These ALARA shielding units reduce personnel exposure to the radiation from the containers as they are moved for assay and other required activities.

14945 (WHC-SD-TP-SWD–004) **Automated Transportation Management System (ATMS) V2.0 logistics module PBI acceptance criteria.** Weidert, R.S. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008882. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the acceptance criteria for the Automated Transportation Management System V2.0 Logistics Module Performance Based Incentive (PBI). This acceptance criteria will be the primary basis for the generation of acceptance test procedures. The purpose of this document is to define the minimum criteria that must be fulfilled to guarantee acceptance of the Logistics Module.

14946 (WHC-SD-WM-PROC–019) **Assembly procedure for Shot Loading Platform.** Routh, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009153. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document describes the assembly procedure for the Shot Loading Platform. The Shot Loading Platform is used by multiple equipment removal projects to load shielding shot in the annular spaces of the equipment storage containers. The platform height is adjustable to accommodate different sizes of storage containers and transport assemblies.

0510 Economic, Industrial, and Business Aspects

Refer also to citation(s) 15130

14947 (DOE/IG–0368) **Report on audit of the Richland Operations Office Site Characterization Program.** USDOE Office of Inspector General, Washington, DC (United States). Mar 1995. 17p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

In 1989 the Secretary of Energy changed the mission of the Richland Operations Office (ROO) from supporting weapons production to environmental restoration and waste management. Through the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement), ROO was required to survey Hanford for contaminants, analyze samples, and determine the most cost-effective method to clean up the waste identified. The objective of this audit was to determine if the Department of Energy (DOE) and ROO had evaluated alternatives to accomplish certain site characterization activities in a cost-effective manner. This audit showed that neither the DOE nor ROO evaluated alternatives to ensure that two site characterization activities were accomplished in a cost-effective manner. First, DOE accelerated the core sampling program for high-level radioactive waste tanks from 6 to 3 years. DOE made this decision in response to a Defense Nuclear Facilities Safety Board (Safety Board) recommendation without first determining if the method chosen (core sampling) was the most efficient and economical method to satisfy the Safety Board's concerns. This 3-year acceleration would cost over $71 million with little increase in benefits. Second, ROO agreed to a Tri-Party Agreement Amendment to require low-level waste samples be analyzed within 25 miles of Hanford. ROO estimated that the 25-mile restriction will require an additional $46 million over an 8-year period. It is recommended that DOE (1) notify the appropriate parties that characterization of the high-level radioactive waste tanks will be completed in the most cost-effective method to achieve program objectives, and (2) negotiate to remove the requirement to perform 80% of low-level waste sample analyses within 25 miles of Hanford. It is also recommended that management perform economic analyses of alternatives before making decisions as to how program objectives will be accomplished.

0520 Waste Management

Refer also to citation(s) 14918, 14919, 14939, 14940, 14945, 15148, 15149, 15160, 15161, 15164, 15173, 15174, 15175, 15176, 15177, 15181, 15188, 15190, 15192, 15193, 15194, 15195, 15209, 15647, 15652, 15669, 15894, 15895, 16120, 16156, 16196, 16206, 16246, 16259, 16261, 16282, 16283, 16296, 16531, 16532, 16533, 16534, 16535, 16536, 16537, 16538, 16557, 16558, 16559, 16560, 16561, 16565, 16566, 16568, 16572, 16573, 16582, 16583, 16593, 16594, 16595, 16631, 16658, 17398, 17399

14948 (ANL/CMT/CP–83588) **Removal of actinide elements from liquid scintillation cocktail wastes using liquid-liquid extraction and demulsification techniques.** Foltz, K. (Univ. of Illinois, Urbana, IL (United States)); Landsberger, S.; Srinivasan, B.; Vandegrift, G.F. Argonne National Lab., IL (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941102–41: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95009897. Source: OSTI; NTIS; INIS; GPO Dep.

For many years liquid scintillation cocktail (LSC) wastes have been generated and stored at Argonne National Laboratory (ANL). These wastes are stored in thousands of 10–20 m scintillation vials, many of which contain elements with $Z > 88$. Because storage space is limited, disposal of this waste is pressing. These wastes could be commercially incinerated if the radionuclides with $Z>88$ are reduced to sufficiently low levels. However, there is currently no deminimus level for these radionuclides, and separation techniques are still being tested. The University of Illinois is conducting experiments to separate radionuclides with $Z > 88$ from simulated LSC wastes by using liquid-liquid extraction (LLX) and demulsification techniques. The actinide elements are removed from the LSC by extraction into an aqueous phase after the cocktail has been demulsified. The aqueous and organic phases are separated and the organic phase, now free from radionuclides with $Z > 88$, can be sent to a commercial incineration facility. The aqueous phase may be treated and disposed of using existing techniques. The LLX separation techniques used solutions of sodium oxalate, aluminum nitrate, and tetrasodium EDTA at varying concentrations. These extractants were mixed with the simulated waste in a 1:1 volume ratio. Using 1.0M Na_4 EDTA salt solutions, decontamination ratios as high as 230 were achieved.

14949 (ANL/CMT/CP–83895) **Behavior of spent fuel under unsaturated conditions.** Finn, P.A. (Argonne National Lab., IL (United States). Chemical Technology Div.); Hoh, J.C.; Bates, J.K.; Wolf, S.F. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–33: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009899. Source: OSTI; NTIS; INIS; GPO Dep.

To evaluate the performance of spent fuel in the potential repository at Yucca Mountain, Nevada, spent fuel fragments are being exposed to small and intermittent amounts of simulated groundwater under unsaturated conditions. Both the leachate and the visual appearance of the spent fuel have been characterized for 581 days of testing. The amount of Am and Cm measured in the leachates was one to two orders of magnitude greater than that released from spent fuel under saturated conditions. The cause of this difference has not been firmly identified but may be attributable to the presence of large amounts of actinide-containing colloids in the leachate of the unsaturated tests.

14950 (ANL/CMT/CP–84354) **Pyroprocessing oxide spent nuclear fuels for efficient disposal.** McPheeters, C.C. (Argonne National Lab., IL (United States). Chemical Technology Div.); Pierce, R.D.; Mulcahey, T.P. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–31: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009901. Source: OSTI; NTIS; INIS; GPO Dep.

Pyrochemical processing as a means for conditioning spent nuclear fuels for disposal offers significant advantages over the direct disposal option. The advantages include reduction in high-level waste volume; conversion of most of the high-level waste to a low-level waste in which nearly all the transuranics (TRU) have been removed; and incorporation of the TRUs into a stable, highly radioactive waste form suitable for interim storage, ultimate destruction, or repository disposal. The lithium process has been under development at Argonne National Laboratory for use in pyrochemical conditioning of spent fuel for disposal. All of the process

steps have been demonstrated in small-scale (0.5-kg simulated spent fuel) experiments. Engineering-scale (20-kg simulated spent fuel) demonstration of the process is underway, and small-scale experiments have been conducted with actual spent fuel from a light water reactor (LWR). The lithium process is simple, operates at relatively low temperatures, and can achieve high decontamination factors for the TRU elements. Ordinary materials, such as carbon steel, can be used for process containment.

14951 (ANL/EA/CP–84147) **Assessment of transportation risk for the U.S. Department of Energy Environmental Management programmatic environmental impact statement.** Chen, S.Y.; Monette, F.A.; Biwer, B.M.; Lazaro, M.A.; Hartmann, H.M.; Policastro, A.J. Argonne National Lab., IL (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–103: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008285. Source: OSTI; NTIS; INIS; GPO Dep.

In its Programmatic Environmental Impact Statement (PEIS), the Office of Environmental Management (EM) of the U.S. Department of Energy (DOE) is considering a broad range of alternatives for the future management of radioactive and hazardous waste at the facilities of the DOE complex. The alternatives involve facilities to be used for treatment, storage, and disposal of various wastes generated from DOE environmental restoration activities and waste management operations. The evaluation includes five types of waste (four types of radioactive waste plus hazardous waste), 49 sites, and numerous cases associated with each alternative for waste management. In general, the alternatives are evaluated independently for each type of waste and reflect decentralized, regionalized, and centralized approaches. Transportation of waste materials is an integral component of the EM PEIS alternatives for waste management. The estimated impact on human health that is associated with various waste transportation activities is an important component of a complete appraisal of the alternatives. The transportation risk assessment performed for the EM PEIS is designed to ensure through uniform and judicious selection of models, data, and assumptions that relative comparisons of risk among the various alternatives are meaningful and consistent. Among other tasks, Argonne National Laboratory is providing technical assistance to the EM PEIS on transportation risk assessment. The objective is to perform a human health risk assessment for each type of waste relative to the EM PEIS alternatives for waste management. The transportation risk assessed is part of the overall impacts being analyzed for the EM PEIS to determine the safest, most environmentally and economically sound manner in which to satisfy requirements for waste management in the coming decades.

14952 (ANL/EA/CP–84165) **Development of chemical profiles for U.S. Department of Energy low-level mixed wastes.** Wang, Y.Y.; Wilkins, B.D.; Meshkov, N.K.; Dolak, D.A. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–102: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008284. Source: OSTI; NTIS; INIS; GPO Dep.

Chemical and radiological profiles of waste streams from US Department of Energy (DOE) low-level mixed wastes (LLMWs) have been developed by Argonne National Laboratory (ANL) to provide technical support information for evaluating waste management alternatives in the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS). The chemical profiles were developed for LLMW generated from both Waste Management (WM) operations and from Environmental Restoration (ER) activities at DOE facilities. Information summarized in the 1994 DOE Mixed Waste Inventory Report (MWIR-2), the Pacific Northwest Laboratory (PNL) Automated Remedial Assessment Methodology (ARAM), and associated PNL supporting data on ER secondary waste streams that will be treated in WM treatment facilities were used as the sources for developing chemical profiles. The methodology for developing the LLMW chemical profiles is discussed, and the chemical profiles developed from data for contact-handled (CH) non-alpha LLMW are presented in this paper. The hazardous chemical composition of remote-handled (RH) LLMW and alpha LLMW follow the chemical profiles developed for CH non-alpha LLMW.

14953 (ANL/EA/CP–85594) **Development of radiological profiles for U.S. Department of Energy low-level mixed wastes.** Wilkins, B.D.; Meshkov, N.K.; Dolak, D.A.; Wang, Y.Y. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–100: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008280. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological profiles have been developed by Argonne National Laboratory for low-level mixed wastes (LLMWs) that are under the management of the US Department of Energy (DOE). These profiles have been used in the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS) to support the analysis of environmental and health risks associated with the various waste management strategies. The radiological characterization of DOE LLMWs is generally inadequate and has made it difficult to develop a site- and waste-stream-dependent radiological profile for LLMWs. On the basis of the operational history of the DOE sites, a simple model was developed to generate site-dependent and waste-stream-independent radiological profiles for LLMWs. This paper briefly discusses the assumptions used in this model and the uncertainties in the results.

14954 (ANL/EA/CP–85596) **The modeling of contaminant flow during proposed treatment of U.S. Department of Energy low-level radioactive mixed wastes.** Dolak, D.A.; Wilkins, B.D.; Kotek, T.J.; Wang, Y.Y.; Meshkov, N.K. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–101: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008281. Source: OSTI; NTIS; INIS; GPO Dep.

Estimations of waste materials throughput and the potential radiological and chemical releases resulting from the proposed treatment of US Department of Energy (DOE) low-level mixed wastes (LLMWs) were used to support analyses of risks and costs associated with various waste management alternatives outlined in the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS). The modeling of material flow and contaminant releases through a consolidated waste management flowchart was performed by the WASTE_MGMT computational model developed by Argonne National Laboratory. This paper (1) briefly describes the process used to model estimated material and contaminant flow through the proposed treatment scenarios for the EM PEIS, (2) discusses the key site- and/or waste-stream-dependent factors involved in the determination of radiological and chemical emissions, and (3) explains the assumptions used to integrate the available LLMW database with the computational model.

14955 (ANL/TD/CP–84268) **Argonne-West facility requirements for a radioactive waste treatment demonstration.** Dwight, C.C.; Felicione, F.S.; Black, D.B.; Kelso, R.B.; McClellan, G.C. Argonne National Lab., IL (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–108: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008291. Source: OSTI; NTIS; INIS; GPO Dep.

At Argonne National Laboratory-West (ANL-W), near Idaho Falls, Idaho, facilities that were originally constructed to support the development of liquid-metal reactor technology are being used and/or modified to meet the environmental and waste management research needs of DOE. One example is the use of an Argonne-West facility to conduct a radioactive waste treatment demonstration through a cooperative project with Science Applications International Corporation (SAIC) and Lockheed Idaho Technologies Company. The Plasma Hearth Process (PBP) project will utilize commercially-adapted plasma arc technology to demonstrate treatment of actual mixed waste. The demonstration on radioactive waste will be conducted at Argonne's Transient Reactor Test Facility (TREAT). Utilization of an existing facility for a new and different application presents a unique set of issues in meeting applicable federal state, and local requirements as well as the

additional constraints imposed by DOE Orders and ANL-W site requirements. This paper briefly describes the PHP radioactive demonstrations relevant to the interfaces with the TREAT facility. Safety, environmental design, and operational considerations pertinent to the PHP radioactive demonstration are specifically addressed herein. The personnel equipment, and facility interfaces associated with a radioactive waste treatment demonstration are an important aspect of the demonstration effort. Areas requiring significant effort in preparation for the PBP Project being conducted at the TREAT facility include confinement design, waste handling features, and sampling and analysis considerations. Information about the facility in which a radioactive demonstration will be conducted, specifically Argonne's TREAT facility in the case of PHP, may be of interest to other organizations involved in developing and demonstrating technologies for mixed waste treatment.

14956 (BARC–1994/E/014) **Partitioning of actinide from simulated high level wastes arising from reprocessing of PHWR fuels: counter current extraction studies using CMPO.** Deshingkar, D.S. (Bhabha Atomic Research Centre, Bombay (India). Process Engineering and Systems Development Div.); Chitnis, R.R.; Wattal, P.K.; Theyyunni, T.K.; Nair, M.K.T.; Ramanujam, A.; Dhami, P.S.; Gopalakrishnan, V.; Rao, M.K.; Mathur, J.N.; Murali,Bhabha Atomic Research Centre, Bombay (India). 1994. 43p. Order Number DE95628049. Source: OSTI; NTIS (US Sales Only); INIS.

High level wastes (HLW) arising from reprocessing of pressurised heavy water reactor (PHWR) fuels contain actinides like neptunium, americium and cerium which are not extracted in the Purex process. They also contain small quantities of uranium and plutonium in addition to fission products. Removal of these actinides prior to vitrification of HLW can effectively reduce the active surveillance period of final waste form. Counter current studies using indigenously synthesised octyl (phenyl)-N, N-diisobutylcarbamoylmethylphosphine oxide (CMPO) were taken up as a follow-up of successful runs with simulated sulphate bearing low acid HLW solutions. The simulated HLW arising from reprocessing of PHWR fuel was prepared based on presumed burnup of 6500 MWd/Te of uranium, 3 years cooling period and 800 litres of waste generation per tonne of fuel reprocessed. The alpha activity of the HLW raffinate after extraction with the CMPO-TBP mixture could be brought down to near background level. (author). 13 refs., 2 tabs., 12 figs.

14957 (CEA-CONF–11923) **Vitrification of radioactive waste. Application to other kinds of waste.** Jouan, A. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1993. 19p. (In French). (CONF-9301158–: Meeting on training for conditioning and characterization of waste, Manosque (France), 26-28 Jan 1993). Order Number DE95627043. Source: OSTI; NTIS (US Sales Only); INIS.

The containment by vitrification of radioactive waste is applied to concentrate solutions of fission products coming from the spent fuel reprocessing. By the way of liquid state to solid state, it is possible to reduce the volume of waste, to get a material with safety guarantees necessary to long storage and the glass by its chemical resistance, its thermal stability and its well resistance to irradiation answers particularly well to these necessities.

14958 (CONF-9304128–, pp. I.2) **Containment development at Paducah Gaseous Diffusion Plant.** O'Connell, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The history of containment development at Paducah Gaseous Diffusion Plant will be presented. Several methods of controlling contamination at the source will be shown. The benefits of the implementation of specific source controls include limiting worker exposure to both chemical and radiological contamination. In addition, workers have been able to remove anti-contamination clothing and respirators reducing heat stress and improving productivity while reducing waste. As a result several areas which were maintained as contaminated areas have been down-posted. The creation of a Contamination Source Containment Committee has been a major factor in containment development. The workings of this committee will be explained and future containment plans will be presented.

14959 (CONF-9304128–, pp. H.23-H.30) **Mixed waste removal from a hazardous waste storage tank.** Geber, K.R. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC05-84OR21400. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The spent fuel transfer canal at the Oak Ridge Graphite Reactor was found to be leaking 400 gallons of water per day into the surrounding soil. Sampling of the sediment layer on the floor of the canal to determine the environmental impact of the leak identified significant radiological contamination and elevated levels of cadmium and lead which are hazardous under the Resource Conservation and Recovery Act (RCRA). Under RCRA regulations and Rules of Tennessee Department of Environment and Conservation, the canal was considered a hazardous waste storage tank. This paper describes elements of the radiological control program established in support of a fast-track RCRA closure plan that involved underwater mapping of the radiation fields, vacuuming, and ultrafiltration techniques that were successfully used to remove the mixed waste sediments and close the canal in a method compliant with state and federal regulations.

14960 (CONF-9304128–, pp. H.31-H.53) **Tank 241-CX-70 waste removal and packaging.** DuVon, D. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-CX-70 is a 30,000 gallon single-shell storage tank built in 1952 to hold high level process waste from pilot tests of the reduction-oxidation (REDOX) process. The tank is constructed of 1/4 inch stainless steel plate 15 feet in depth and 20 feet in diameter and is buried approximately 14 feet below grade. The tank is surrounded by 1 foot of poured concrete on the top and sides with a concave bottom thickness varying from 9 inches in the center to 2 feet at the edge. There are 9 risers extending above ground and a man-way 42 inches in diameter. The tank is located 128 feet South-East of the Strontium Semiworks area in the 200 East Area of the Hanford Site. In 1979 decommissioning operations were begun by pumping liquid waste from the tank to the double-shell tank 101-AY. Not all the wastes was removed at that time. Approximately 10,300 gallons of sludge remained.

14961 (CONF-940815–112) **Mercury removal from solid mixed waste.** Gates, D.D.; Morrissey, M.; Chava, K.K.; Chao, K. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE95008846. Source: OSTI; NTIS; INIS; GPO Dep.

The removal of mercury from mixed wastes is an essential step in eliminating the temporary storage of large inventories of mixed waste throughout the Department of Energy (DOE) complex. Currently thermal treatment has been identified as a baseline technology and is being developed as part of the DOE Mixed Waste Integrated Program (MWIP). Since thermal treatment will not be applicable to all mercury containing mixed waste and the removal of mercury prior to thermal treatment may be desirable, laboratory studies have been initiated at Oak Ridge National Laboratory (ORNL) to develop alternative remediation technologies capable of removing mercury from certain mixed waste. This paper describes

laboratory investigations of the KI/I_2 leaching processes to determine the applicability of this process to mercury containing solid mixed waste.

14962 (CONF-941144–107) **Performance of cement-based seal-system components in a waste-disposal environment.** Malone, P.G. (US Army Engineer Waterways Experiment Station, Vicksburg, MS (United States)); Wakeley, L.D.; Burkes, J.P.; McDaniel, E.W. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI05-90OR21921. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95008840. Source: OSTI; NTIS; INIS; GPO Dep.

A grout based on portland cement, Class F fly ash, and bentonite clay was developed as part of the closure system of shallow subsurface structures for disposal of low-activity radioactive wastes. Heat output, volume change, and compressive strength of the sealing grout were monitored with time, at elevated temperature, and in physical models, to determine if this closure grout could maintain adequate volume stability and other required physical properties in the internal environment of the disposal structure. To determine if contact with an alkaline liquid waste would cause chemical deterioration of the sealing grout, cured specimens were immersed in a liquid waste simulant containing high concentrations of sodium and aluminum salts. After 21 days at 60 C, specimens increased in mass without significant changes in volume. XRD revealed crystallization of sodium aluminum silicate hydrate. The new phase has an XRD pattern similar to the commercial synthetic zeolite Losod. Scanning electron microscopy used with x-ray fluorescence showed that clusters of this phase had formed in grout pores, to increase rout density and decrease its effective porosity. Testing was repeated at 100 C for 5 days using a simulant containing sodium hydroxide and aluminum nitrate and results were similar. Physical and chemical tests indicate acceptable performance of this grout as a seal-system component.

14963 (CONF-950216–95) **Integration of remediation strategy with waste management capabilities and regulatory drivers for radioactive waste storage tanks at the Oak Ridge National Laboratory.** Baxter, J.T. (H&R Technical Associates, Inc., Oak Ridge, TN (United States)); Hepworth, H.K.; Hooyman, J.H. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95009174. Source: OSTI; NTIS; INIS; GPO Dep.

This paper addresses the plans and strategies for remediation of the Liquid Low-Level Waste (LLLW) system tanks that have been removed from service at the Oak Ridge National Laboratory (ORNL). The Superfund Amendments and Reauthorization Act of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a Federal Facility Agreement (FFA) for federal facilities placed on the National Priorities List. The Oak Ridge Reservation was placed on that list on December 21, 1989, and the agreement was signed in November 1991 by the U.S. Department of Energy Oak Ridge Operations Office (DOE-ORO), the EPA-Region IV, and the Tennessee Department of Environment and Conservation (TDEC). The effective date of the FFA is January 1, 1992. One requirement of the FFA is that LLLW tanks that are removed from service must be evaluated and remediated through the CERCLA process. The Environmental Restoration Program intends to meet this requirement by using a "streamlined' approach for selected tanks. This approach will combine the CERCLA Site Investigation. Remedial Action, Feasibility Study, and Proposed Plan requirements into a single Interim Proposed Plan document. This streamlined approach is expected to reduce the time required to complete the regulatory process while attaining acceptable risk reduction in a cost-effective way.

14964 (CONF-950232–31) **Test bed control center design concept for Tank Waste Retrieval Manipulator Systems.** Sundstrom, E. (Human Machine Interfaces, Inc., Knoxville, TN (United States)); Draper, J.V.; Fausz, A. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95006391. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the design concept for the control center for the Single Shell Tank Waste Retrieval Manipulator System test bed and the design process behind the concept. The design concept supports all phases of the test bed mission, including technology demonstration, comprehensive system testing, and comparative evaluation for further development and refinement of the TWRMS for field operations.

14965 (CONF-950740–15) **In-tank fluid sloshing effects during earthquakes: A preliminary computational simulation.** Park, J.E.; Rezvani, M.A. Oak Ridge National Lab., TN (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995. Order Number DE95008902. Source: OSTI; NTIS; GPO Dep.

Hundreds of underground radioactive waste storage tanks are located at Department of Energy (DOE) sites. At present, no technique for evaluating the pressure loads due to the impact of earthquake generated waves on the side walls and dome of the tanks is known if the wave breaks back on itself. This paper presents the results of two-dimensional Computational Fluid Dynamics (CFD) calculations of the motion of waves in a generic rectangular tank as the result of accelerations recorded during an earthquake. The advantages and limitations of this technique and methods for avoiding the limitations will be discussed.

14966 (DOE/EA–0906) **Waste Characterization Facility at the Idaho National Engineering Laboratory. Environmental Assessment.** USDOE Idaho Operations Office, Idaho Falls, ID (United States). Feb 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95009932. Source: OSTI; NTIS; INIS; GPO Dep.

DOE has prepared an Environmental Assessment (EA) on the proposed construction and operation of a Waste Characterization Facility (WCF) at INEL. This facility is needed to examine and characterize containers of transuranic (TRU) waste to certify compliance with transport and disposal criteria; to obtain information on waste constituents to support proper packaging, labeling, and storage; and to support development of treatment and disposal plans for waste that cannot be certified. The proposed WCF would be constructed at the Radioactive Waste Management Complex (RWMC). In accordance with the Council on Environmental Quality (CEQ) requirements in 40 CFR Parts 1500-1508, the EA examined the potential environmental impacts of the proposed WCF and discussed potential alternatives. Based on the analyses in the EA, DOE has determined that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969, and CEQ regulations at 40 CFR 1508.18 and 1508.27. Therefore, an Environmental Impact Statement is not required, and DOE is issuing this Finding of No Significant Impact.

14967 (DOE/EA–0944) **222-S radioactive liquid waste line replacement and 219-S secondary containment upgrade, Hanford Site, Richland, Washington.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008190. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) is proposing to: (1) replace the 222-S Laboratory (222-S) radioactive liquid waste drain lines to the 219-S Waste Handling Facility (219-S); (2) upgrade 219-S by replacing or upgrading the waste storage tanks and providing secondary containment and seismic restraints to the concrete cells which house the tanks; and (3) replace the transfer lines from 219-S to the 241-SY Tank Farm. This environmental assessment (EA) has been prepared in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended, the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500-1508), and the DOE Implementing Procedures for NEPA (10 CFR 1021). 222-S is used to perform analytical services

on radioactive samples in support of the Tank Waste Remediation System and Hanford Site environmental restoration programs. Activities conducted at 222-S include decontamination of analytical processing and support equipment and disposal of nonarchived radioactive samples. These activities generate low-level liquid mixed waste. The liquid mixed waste is drained through pipelines in the 222-S service tunnels and underground concrete encasements, to two of three tanks in 219-S, where it is accumulated. 219-S is a treatment, storage, and/or disposal (TSD) unit, and is therefore required to meet Washington Administrative Code (WAC) 173-303, Dangerous Waste Regulations, and the associated requirements for secondary containment and leak detection. The service tunnels are periodically inspected by workers and decontaminated as necessary to maintain as low as reasonably achievable (ALARA) radiation levels. Although no contamination is reaching the environment from the service tunnels, the risk of worker exposure is present and could increase. 222-S is expected to remain in use for at least the next 30 years to serve the Hanford Site environmental cleanup mission.

14968 (DOE/EW/00003–3) **Application of best available science to the regulatory process: The case of environmental regulations. Final technical report, February 1990–January 1993.** Moghissi, A.A. Maryland Univ., Baltimore, MD (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90EW00003. Order Number DE95009649. Source: OSTI; NTIS; GPO Dep.

The current grant was a continuation of a previous grant awarded to the Institute for Regulatory Science. In July 1989, the functions of the Institute were transferred to the University of Maryland and the studies started at the Institute were continued at the University. The current grant started February 1, 1990. The objective of the project was to assure that societal decisions are based on the best available science (BAS). Previously, it was demonstrated that there are four categories of scientific information. These are: (1) Personal opinions; (2) Gray literature; (3) Peer-reviewed information; (4) Consensus scientific information. Each one of them is discussed under specific headings.

14969 (DOE/LLW–195) **RCRA designation of discarded americium/beryllium sealed sources.** Kirner, N.P. (Ebasco Environmental, Idaho Falls, ID (United States)). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); Ebasco Environmental, Idaho Falls, ID (United States). Sep 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008619. Source: OSTI; NTIS; INIS; GPO Dep.

Many sealed sources containing americium and beryllium are used throughout construction, industry, and research, and will eventually require disposal. For planning purposes it is necessary to determine whether these sources, when disposed, constitute a mixed waste, i.e., a waste containing hazardous constituents regulated under the Resource Conservation and Recovery Act and radioactive constituents regulated under the Atomic Energy Act. Waste designation criteria contained in 40 CFR 261 are evaluated in detail in this report. It is determined that discarded americium/beryllium sealed sources do not contain any wastes listed in Subpart D of 40 CFR 261, nor do the discarded sources exhibit any hazardous characteristics. Therefore, it is concluded that discarded americium/beryllium sealed sources are not a mixed waste under regulations established by the US Environmental Protection Agency. Hazardous waste regulatory programs delegated to States, however, may have regulations that differ from those of the Federal government.

14970 (DOE/MC/30170–95/C0438) **Advanced technologies for decontamination and conversion of scrap metals.** Muth, T.R. (Manufacturing Sciences Corp., Oak Ridge, TN (United States)); Moore, J.; Olson, D.; Mishra, B. Manufacturing Sciences Corp., Oak Ridge, TN (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30170. (CONF-9411149–25: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95008947. Source: OSTI; NTIS; INIS; GPO Dep.

Recycle of radioactive scrap metals (RSM) from decommissioning of DOE uranium enrichment and nuclear weapons manufacturing facilities is mandatory to recapture the value of these metals and avoid the high cost of disposal by burial. The scrap metals conversion project detailed below focuses on the contaminated nickel associated with the gaseous diffusion plants. Stainless steel can be produced in MSC's vacuum induction melting process (VIM) to the S30400 specification using nickel as an alloy constituent. Further the case alloy can be rolled in MSC's rolling mill to the mechanical property specification for S30400 demonstrating the capability to manufacture the contaminated nickel into valuable end products at a facility licensed to handle radioactive materials. Bulk removal of Technetium from scrap nickel is theoretically possible in a reasonable length of time with the high calcium fluoride flux, however the need for the high temperature creates a practical problem due to flux volatility. Bulk decontamination is possible and perhaps more desirable if nickel is alloyed with copper to lower the melting point of the alloy allowing the use of the high calcium fluoride flux. Slag decontamination processes have been suggested which have been proven technically viable at the Colorado School of Mines.

14971 (DOE/NV/11432–T5) **A water infiltration model: Study of reusability in an environmental engineering problem.** Cawlfield, D.E. (Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV (United States)); Lindstrom, F.T.; Miel, G.J. Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95008140. Source: OSTI; NTIS; GPO Dep.

The paper describes a computer simulation, involving a site characterization for the storage of low-level radioactive waste at the Nevada Test Site, in order to highlight the reutilization in that project of skills and tools used in aerospace computing.

14972 (DOE/OR–03-1195-D2) **Design demonstrations for Category B tank systems piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Dec 1994. 391p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–193-D2). Order Number DE95008964. Source: OSTI; NTIS; INIS; GPO Dep.

Demonstration of the design of the piping systems described in this report is stipulated by the Federal Facility Agreement (FFA) between the U.S. Environmental Protection Agency (EPA)-Region IV, the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Department of Energy (DOE). This report provides a design demonstration of the secondary containment and ancillary equipment of 30 piping systems designated in the FFA as Category B (i.e., existing tank systems with secondary containment). Based on the findings of the Design Demonstrations for the Remaining 19 Category B Tank Systems, (DOE/OR/03-1150 & D2), three tank systems originally designated as Category B have been redesignated as Category C (i.e., existing tank systems without secondary containment). The design demonstrations were developed using information obtained from design drawings (as-built when available), construction specifications, and interviews with facility operators. Each design demonstration addresses system conformance to the requirements of the FFA (Appendix F, Section C). Deficiencies or restrictions regarding the ability to demonstrate that each of the containment systems conforms to FFA requirements are noted in the discussion of each piping system and presented in Table 2.0-1.

14973 (DOE/OSTI–3406-Suppl.4-Add.1) **Yucca Mountain Site Characterization Project Bibliography, January–June 1993. An update: Supplement 4, Addendum 1.** Stephan, P.M. (ed.). USDOE Office of Scientific and Technical Information, Oak Ridge, TN (United States). Jan 1995. 31p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94014499. Source: OSTI; NTIS; INIS; GPO Dep.

Following a reorganization of the Office of Civilian Radioactive Waste Management in 1990, the Yucca Mountain Project was renamed Yucca Mountain Site Characterization Project. The title of this bibliography was also changed to Yucca Mountain Site Characterization Project Bibliography. Prior to August 5, 1988, this

project was called the Nevada Nuclear Waste Storage Investigations. This bibliography contains information on this ongoing project that was added to the Department of Energy's Energy Science and Technology Database from January 1, 1994 through June 30, 1994. The bibliography is categorized by principal project participating organization. Participant-sponsored subcontractor reports, papers,and articles are included in the sponsoring organization's list. Another section contains information about publications on the Energy Science and Technology Database that were not sponsored by the project but have some relevance to it.

14974 (DOE/RL–88-30-Rev.4-Vol.1) **Hanford Site waste management units report. Revision 4, Volume 1.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). [1995]. 723p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009600. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site waste management units report (hereafter referred to simply as the "units report") was originated to provide information responsive to Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984. The units report provides a comprehensive inventory of all types of waste management units at the Hanford Site, including a description of the units and the waste they contain. Waste management units in the report include: Resource Conservation and Recovery Act of 1976 (RCRA) disposal units; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) disposal units; unplanned releases; inactive contaminated structures; RCRA treatment, storage, and disposal (TSD) units; and other storage areas. Because of the comprehensive nature of the units report, the list of units is more extensive than required by Section 3004(u) of Hazardous and Solid Waste Amendments of 1984. The information in this report is extracted from the Waste Information Data System (WIDS). The WIDS database provides additional information concerning the waste management units contained in this report and is maintained with current changes to these waste management units. This report is updated annually if determined necessary per the Hanford Federal Facility Agreement and Consent Order (commonly known as the Tri-Party Agreement).

14975 (DOE/RL–88-30-Rev.4-Vol.2) **Hanford Site waste management units report: Sample and data management. Revision 4, Volume 2.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jan 1955. 562p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009601. Source: OSTI; NTIS; GPO Dep.

The Hanford Site waste management units report (hereafter referred to simply as the "units report") was originated to provide information responsive to Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984. The units report provides a comprehensive inventory of all types of waste management units at the Hanford Site, including a description of the units and the waste they contain. Waste management units in the report include: Resource Conservation and Recovery Act of 1976 (RCRA) disposal units; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) disposal units; unplanned releases; inactive contaminated structures; RCRA treatment, storage, and disposal (TSD) units; and other storage areas. Because of the comprehensive nature of the units report, the list of units is more extensive than required by Section 3004(u) of Hazardous and Solid Waste Amendments of 1984. The information in this report is extracted from the Waste Information Data System (WIDS). The WIDS database provides additional information concerning the waste management units contained in this report and is maintained with current changes to these waste management units. This report is updated annually if determined necessary per the Hanford Federal Facility Agreement and Consent Order (commonly known as the Tri-Party Agreement).

14976 (DOE/RL–93-94-Rev.1) **Plan and schedule for disposition and regulatory compliance for miscellaneous streams. Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 25p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009086. Source: OSTI; NTIS; INIS; GPO Dep.

On December 23, 1991, the U.S. Department of Energy, Richland Operations Office (RL) and the Washington State Department of Ecology (Ecology) agreed to adhere to the provisions of Department of Ecology Consent Order No. DE 91NM-177 (Consent Order). The Consent Order lists regulatory milestones for liquid effluent streams at the Hanford Site to comply with the permitting requirements of Washington Administrative Code (WAC) 173-216 (State Waste Discharge Permit Program) or WAC 173-218 (Washington Underground Injection Control Program) where applicable. Hanford Site liquid effluent streams discharging to the soil column have been categorized in the Consent Order as follows: Phase I Streams Phase II Streams Miscellaneous Streams. Phase I and Phase II Streams are addressed in two RL reports: "Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site" (DOE-RL 1987), and "Annual Status of the Report of the Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site". Miscellaneous Streams are those liquid effluent streams discharged to the ground that are not categorized as Phase I or Phase II Streams. Miscellaneous Streams discharging to the soil column at the Hanford Site are subject to the requirements of several milestones identified in the Consent Order. This document provides a plan and schedule for the disposition of Miscellaneous Streams. The disposition process for the Miscellaneous Streams is facilitated using a decision tree format. The decision tree and corresponding analysis for determining appropriate disposition of these streams is presented in this document.

14977 (DOE/RL–94-42-Draft-A) **100-BC-2 limited field investigation report.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1994. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009615. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the 100-BC-2 Operable Unit limited field investigation and presents the associated qualitative risk assessment. This report also provides recommendations on the continued candidacy for interim remedial measures (IRM) for the three high-priority waste sites and the 11 solid waste burial grounds in this operable unit. The 100-BC-2 Source Operable Unit consists of an area about 1.7 km^2 (0.6 mi^2) within the Hanford B/C Area; it contains waste sites associated with the original plant facilities constructed to support the operation of the C Reactor and liquid, sludge, and solid waste units.

14978 (DOE/RL–94-47-Rev.1) **Proposed plan for the Environmental Restoration Disposal Facility (ERDF) at the Hanford Site, Richland, Washington. Revision 1.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008220. Source: OSTI; NTIS; INIS; GPO Dep.

This plan proposes construction and operation of the Environmental Restoration Disposal Facility (ERDF) for disposing waste from cleanup of the Hanford Site. The ERDF is proposed to be a single-trench landfill, capable of receiving only Hanford cleanup waste. The landfill would be closed with a protective cap. The ERDF would include roads, vehicles, a decontamination facility, and other facilities to support waste disposal. The cleanup waste may include soil, nibble, or other materials contaminated with hazardous (chemical), low-level radioactive, or mixed (combined hazardous chemical and radioactive) wastes removed from the Hanford Site. This proposed action would initially authorize construction and operation of two landfill cells capable of receiving approximately 1 million cubic yards of cleanup waste removed from along the Columbia River on the Hanford Site.

14979 (DOE/RL–94-55-Rev.1) **Hanford analytical services quality assurance plan. Revision 1.** Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–9803-Rev.1). Order Number DE95009997. Source: OSTI; NTIS; INIS; GPO Dep.

This document, the Hanford Analytical Services Quality Assurance Plan (HASQAP), is issued by the U.S. Department of Energy,

Richland Operations Office (RL). The HASQAP establishes quality requirements in response to U.S. Department of Energy (DOE) Order 5700.6C, Quality Assurance (10 CFR 830.120, "Quality Assurance Requirements"). The HASQAP is designed to meet the needs of the RL for controlling the of analytical chemistry services provided by laboratory operations. The HASQAP is issued through the Analytical Services Branch of the Waste Management Division. The Analytical Services Branch is designated by the RL as having the responsibility for oversight management of laboratory operations under the Waste Management Division. The laboratories conduct sample analyses under several regulatory statutes, such as the Clean Air Act and the Clean Water Act. Sample analysis in support of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) is a major role of the laboratory operations.

14980 (DOE/RL–94-131) **Letter report for skyshine abatement assessment.** Department of Energy, Richland, WA (United States). Richland Operations Office. Mar 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009011. Source: OSTI; NTIS; INIS; GPO Dep.

The term "skyshine," as used in this report, refers to radiation that originates from the 1301-N/1 325-N Liquid Waste Disposal Facilities (LWDF) and reflects back to the surrounding 100 N Area. Skyshine was first observed in 1980 by 100 N Area operators who were able to correlate elevated radiation readings with the amount of water shielding over 1301-N (i.e., depth of water maintained over 1301-N). Since 1980, measures have been taken to hold the errant radiation in abeyance. The most prominent of those measures are the concrete panels that reside atop 1301-N and 1325-N. This letter report has been issued in support of the overall 100 N Area strategy to address whether the effects of skyshine adversely impact the public who may pass by 1301-N/1325-N in the course of traveling along the Columbia River, or who trespass on the southeastern bank. The most likely trespassers are those who may fish or camp on the 100 N Area shoreline. Although the public is legally prohibited from trespassing along the shoreline, it is possible for the public to gain access to the 100 N Area shoreline. It is legal for the public to boat along the 100 N Area shoreline. In response to this concern, Tri-Party Agreement (TPA) Milestone M-16-12 was established. This report addresses whether a pre-remedial action for abatement of skyshine from 1301-N/1325-N is necessary to protect the general public prior to implementing the 1301-N/1325-N Closure Plan/Corrective Measure Study. The term "pre-remedial action" is used in this report because remedial actions for final site closure will be addressed in the 1301-N/1325-N Closure Plan/Corrective Measure Study. Skyshine from 1301-N/1325-N may have an effect on 100 N Area workers; however, such exposures are being addressed in numerous other ways such as Hanford Site safety procedures, the 1301-N/1325-N Closure Plan/Corrective Measure Study, and the 100-NR-1-Closure Measure Study.

14981 (DOE/RL–95-23) **1994 tier two emergency and hazard chemical inventory.** Zaloudek, D.E. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 87p. Order Number DE95009087. Source: OSTI; NTIS; GPO Dep.

This document is the 1994 Tier Two Emergency and Hazardous Chemical Inventory, Emergency Planning and Community Right-to-Know Act, Section 312 was prepared by the US DOE. This program is designed to provide state and local officials and the public with specific information on hazardous chemicals present at a facility. The report contains the following sections: delegation of signature authority, tier two instructions, chemical index, tier two forms and site plans.

14982 (DOE/WIPP–93-025-Rev.1) **Carlsbad Area Office strategic plan, March 1995. Revision 1.** USDOE Carlsbad Area Office, NM (United States). Mar 1995. 36p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009650. Source: OSTI; NTIS; INIS; Copies of this document may be obtained by calling 1-800-336-WIPP (1-800-366-9477).; GPO Dep.

This edition of the Carlsbad Area Office Strategic Plan captures the US Department of Energy's (DOE's) new focus, and supersedes the edition issued previously (DOE, 1993a). This revision reflects: a revised strategy designed to demonstrate compliance with environmental regulations earlier than the previous course of action; and a focus on establishment of standardized transuranic waste characterization and acceptance criteria for disposal facilities.

14983 (DOE/YMSCO–002) **Applications of natural analogue studies to Yucca Mountain as a potential high level radioactive waste repository.** Science Applications International Corp., Las Vegas, NV (United States). Feb 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-87NV10576. Order Number DE95009812. Source: OSTI; NTIS; INIS; GPO Dep.

The 5-member group convened in Las Vegas, Nov. 11-13, 1991, to clarify the extent to which studies of natural analogues can assist the Yucca Mountain site characterization (SC) project. This document is to provide guidance and recommendations to DOE for the implementation of natural analogue studies in the SC program. Performance assessment, integrity of engineered barriers, and communication to the public and the scientific community are stressed. The reference design being developed by Babcock & Wilcox Fuel Company are reviewed. Guidelines for selecting natural analogues are given. Quality assurance is discussed. Recommendations are given for developing an effective natural analogue program within the SC program.

14984 (EGG-WM–10962) **Interim report: Waste management facilities cost information for mixed low-level waste.** Feizollahi, F.; Shropshire, D. Idaho National Engineering Lab., Idaho Falls, ID (United States). Mar 1994. 302p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95009458. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains preconceptual designs and planning level life-cycle cost estimates for treating alpha and nonalpha mixed low-level radioactive waste. This report contains information on twenty-seven treatment, storage, and disposal modules that can be integrated to develop total life cycle costs for various waste management options. A procedure to guide the US Department of Energy and its contractor personnel in the use of estimating data is also summarized in this report.

14985 (FEMP–2344) **What will we do with 104,000,000 cubic feet of Fernald waste?.** Motl, G.P. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project); Krieger, G.J.; Rast, D.M. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-941214–5: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95009013. Source: OSTI; INIS; NTIS; GPO Dep.

The Fernald Site, a Department of Energy (DOE) uranium metal production facility that ceased production in 1989, is now being remediated by the DOE under terms of a Consent Agreement with the United States Environmental Protection Agency (USEPA) and a Consent Decree with the State of Ohio. It is estimated that the cleanup will generate 104,000,000 cubic feet of low-level radioactive waste including construction debris, pit sludge, radium residue and a huge volume of uranium contaminated soil. The waste handling strategy for this huge volume of waste includes minimizing remedial waste generation, recycling material when economically feasible, free-releasing clean material and volume reduction. It is anticipated that large scale radium residue vitrification and sludge drying equipment/facilities will be constructed onsite for waste treatment prior to off-site disposal. Fernald waste disposition will include both onsite disposal (if approved under CERCLA) and off-site disposal at both commercial and DOE waste disposal facilities. The waste disposition strategy selected reflects a diverse variety of technical, political, regulatory and economic factors. This presentation will describe the current views at Fernald on "what will we do with 104,000,000 cubic feet of Fernald waste."

14986 (FEMP–2356) **An integrated building demolition and waste planning model for the Fernald Site.** Hampshire, L.H. (FERMCO, Cincinnati, OH (United States)); Clark, T.R.; Frost,

M.L.; Reising, J.W. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–90: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009014. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald DOE site will begin full-scale remediation of buildings under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) during the 1995 fiscal year pursuant to a signed Record of Decision. This effort is currently estimated to cost $350 million and span a minimum duration of 8 years, if funding is not a constraint. The identification of the most viable sequence and schedule for the effort involved the development of an integrated planning model and the commissioning of a sitewide planning team. The resulting work product represents the best combination of assumptions and calculations possible at this time and provides information necessary for compliance with the CERCLA Remedial Design documentation requirements for the over 230 component structures governed by the decision. Sequence and integrated schedule development for the decontamination and dismantlement (D&D) of Fernald structures has involved evaluation of current and future utilization of structures, availability of waste storage and staging space, the needs and impacts of other on-going Fernald projects, Resource Conservation and Recovery Act (RCRA) waste management and remediation projects, the layout of site utilities, site hydrology, and the potential sizing, location, and construction rates for an on-property disposal cell.

14987 (FEMP–2366) **Potential impacts of pending residual radioactivity rules.** Burns, D.D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–92: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009015. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to present an overview of pending rules governing residual radioactive release criteria and radioactive waste management, and the potential impact of these rules on the Fernald Scrap Metal program. More than 300,000 cubic meters of radioactively contaminated waste will be generated during the dismantlement of three complexes at the Fernald Site over the next year and a half. Under current regulations, as much as 70% (5,000 tons) of steel will be either recycled or re-used in controlled applications. Depending on regulatory developments, the ratios of recycling to burial will range from 100% burial to recycling more than 90% of the waste. The absence of federal rules and regulations for classification of permissible levels of residual radioactivity is one of the most troublesome issues in the nuclear industry. The issue is growing in importance with the approaching end of useful life for many nuclear power generating stations and the planned remediation of the DOE nuclear weapons complex. Federal regulators have been involved in the "Enhanced rulemaking" process for over two years. The DOE Fernald site offers a good opportunity for understanding the potential impacts of the pending residual radioactivity regulations due to the maturity of the planned D&D activities, aggressive recycling program, and simple nature of contamination. The Fernald experience may offer a point of departure for many facilities engaged in D&D and waste management.

14988 (FEMP–2370) **In situ construction of horizontal soil containment barrier at Fernald.** Ridenour, D. (FERMCO, Cincinnati, OH (United States). Fernald Environmental Management Project); Pettit, P.J.; Walker, J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–96: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009117. Source: OSTI; NTIS; INIS; GPO Dep.

An innovative method of placing soil barriers to contain vertical flow is being prepared for demonstration by the Fernald Environmental Restoration Management Corporation (FERMCO), working in conjunction with the Department of Energy Office of Technology Development (DOE/OTD) and two principle subcontractors. The method employs proven directional drilling techniques, jet grouting technology and unique placement tooling to form horizontal soil barriers in situ. This is done without disturbance to existing land disposed wastes. This paper is a summary report on the current state of that demonstration, including: a discussion of the construction methods, the results of the initial tool tests, an overview of the Fernald site conditions and, the resulting path of tooling development for the second phase of tool testing.

14989 (GSF–12/94) **The HAW project. Test storage of high-level radiation sources in the Asse salt mine. Documentation and assessment of the storage system.** Mueller, K.; Rothfuchs, T. GSF - Forschungszentrum fuer Umwelt und Gesundheit GmbH, Braunschweig (Germany). Inst. fuer Tieflagerung. 1994. 129p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany);Commission of the European Communities, Brussels (Belgium). Foerderkennzeichen BMFT KWA8507A; Foerderkennzeichen CEC FI2W-CT (GSF-TL–5/94). Order Number DE95769156. Source: OSTI; NTIS (US Sales Only); INIS.

The HAW project aimed primarily at studying the interaction between high-level radioactive waste moulds and rock salt as the respository medium. Another priority was the prototype development and testing of a technical system for the emplacement of high-level radioactive moulds in deep storage boreholes. To simulate real high-level radioactive wastes, special high-level radiation sources (Cs-137, Sr-90) were produced in the United States of America under a German-American cooperation contract, for carrying out the tests at the Asse salt mine. The components of the storage system are described, their position and task within the entire handling procedure explained. Questions of radiation protection and accident protection, of functioning and operating reliability, of quality assurance and examination of documents, materials, of manufacture and functioning, and of documentation are dealt with in detail. With a view to the planning of storage techniques for a mine respository, the experience of development and operation is recorded, and recommendation of further developments are given. Problems which arose during work on the HAW project were partly due to test-specific reasons and will not or not in this form occur in a mine respository. It was planned to start the test emplacement in 1987, and it could have been executed in 1993 after appropriate preparation and approval of the storage system by the mining authority and the Hanover TUEV in 1991. In December 1992, however, the Federal Government decided to give up to the project due to the uncertain licensing situation, and to immediately stop all preparatory work. (orig./HP)

14990 (IAEA-TECDOC–775) **Handling, treatment, conditioning and storage of biological radioactive wastes. Technical manual for the management of low and intermediate level wastes generated at small nuclear research centres and by radioisotope users in medicine, research and industry.** International Atomic Energy Agency, Vienna (Austria). Dec 1994. 48p. Order Number DE95627044. Source: OSTI; NTIS (US Sales Only); INIS.

Biological materials that contain radioactive isotopes have many important applications. During the production and use of these materials, waste will inevitably arise which must be managed with particular care due to their potential biological as well as radiological hazards. This report deals with wastes that arise outside the nuclear fuel cycle and is directed primarily to countries without nuclear power programmes. It is intended to provide guidance to Member States in the handling, treatment and conditioning of biological radioactive materials. The objective of radioactive waste management is to handle, pretreat, treat, condition, store, transport and dispose of radioactive waste in a manner that protects human health and the environment without imposing undue burdens on future generations. 31 refs, 15 figs, 3 tabs.

14991 (IAEA-TECDOC–776) **Reference design for a centralized waste processing and storage facility. Technical manual for the management of low and intermediate level wastes generated at small nuclear research centres and by radioisotope users in medicine, research and industry.** International Atomic

Energy Agency, Vienna (Austria). Dec 1994. 108p. Order Number DE95627045. Source: OSTI; NTIS (US Sales Only); INIS.

The objective of this report is to present the generic reference design of a centralized waste processing and storage facility (WPSF) intended for countries producing small but significant quantities of liquid and solid radioactive wastes. These wastes are generated through the use of radionuclides for research, medical, industrial and other institutional activities in IAEA Member States that have not yet developed the infrastructure for a complete nuclear fuel cycle. The WPSF comprises two separate buildings. The first, for receiving and processing waste from the producers, includes the necessary equipment and support services for treating and conditioning the waste. The second building acts as a simple but adequate warehouse for storing a ten year inventory of the conditioned waste. In developing the design, it was a requirement of the IAEA that options for waste management techniques for each of the waste streams should be evaluated, in order to demonstrate that the reference design is based on the most appropriate technology. Refs, figs and tabs.

14992 (IAEA-TECDOC–789) **Preparation of safety analysis reports (SARs) for near surface radioactive waste disposal facilities. Format and content of SARs.** International Atomic Energy Agency, Vienna (Austria). Feb 1995. 23p. Order Number DE95628050. Source: OSTI; NTIS (US Sales Only); INIS.

All facilities at which radioactive wastes are processed, stored and disposed of have the potential for causing hazards to humans and to the environment. Precautions must be taken in the siting, design and operation of the facilities to ensure that an adequate level of safety is achieved. The processes by which this is evaluated is called safety assessment. An important part of safety assessment is the documentation of the process. A well prepared safety analysis report (SAR) is essential if approval of the facility is to be obtained from the regulatory authorities. This TECDOC describes the format and content of a safety analysis report for a near surface radioactive waste disposal facility and will serve essentially as a checklist in this respect.

14993 (INEL–94/00052) **Case study and presentation of the DOE treatability group concept for low-level and mixed waste streams.** Kirkpatrick, T.D. (Lockheed Idaho Technologies, Germantown, MD (United States)); Heath, B.A.; Davis, K.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941214–6: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95008616. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Compliance Act of 1992 requires the US Department of Energy (DOE) to prepare an inventory report of its mixed waste and treatment capacities and technologies. Grouping waste streams according to technological requirements is the logical means of matching waste streams to treatment technologies, and streamlines the effort of identifying technology development needs. To provide consistency, DOE has developed a standard methodology for categorizing waste into treatability groups based on three characteristic parameters: radiological, bulk physical/chemical form, and regulated contaminant. Based on category and component definitions in the methodology, descriptive codes or strings of codes are assigned under each parameter, resulting in a waste characterization amenable to a computerized format for query and sort functions. By using only the applicable parameters, this methodology can be applied to all waste types generated within the DOE complex: radioactive, hazardous, mixed, and sanitary/municipal. Implementation of this methodology will assist the individual sites and DOE Headquarters in analyzing waste management technology and facility needs.

14994 (IS–5111) **Analysis of waste-vitrification process samples: Improvements in sample preparation and analysis methods.** Baldwin, D.P.; Zamzow, D.S.; D'Silva, A.P. Ames Lab., IA (United States). 30 Jun 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010235. Source: OSTI; NTIS; INIS; GPO Dep.

Radwaste vitrification at West Valley requires timely chemical analysis of glass-former materials, waste from the tanks, mixed precursors in slurry form prior to melting, and shards of the final glass. Since the final glass quality depends on the slurry composition, the slurry analyses must be performed as quickly as possible. Feasibility of alternative analytical methods for the slurry was studied, including rapid dissolution methods combined with direct and pneumatic nebulization of the samples and analysis by inductively coupled plasma atomic emission spectrometry (ICPAES), as well as some laser ablation-ICPAES methods. All methods were evaluated in terms of speed, accuracy, and precision, and applicability in a hot cell or glove box. The digestion procedure and analytical line selection are covered in an appendix.

14995 (KCP–613-5532) **Opportunity assessments: A tool for waste minimization and pollution prevention.** Pemberton, S.E.; Schlosberg, W.H. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. (CONF-950216–93: Waste management '95; ECM '95 conference, Tucson, AZ (United States); Las Cruces, NM (United States), 26 Feb - 2 mar 1995; 12-15 mar 1995; CONF-9503119–1). Order Number DE95008949. Source: OSTI; NTIS; GPO Dep.

Waste costs, liabilities, and regulations continue to be growing concerns for government and industry. Pollution prevention opportunity assessments (PPOAs) are a tool which proactively manages these concerns. The Department of Energy (DOE) has recognized the benefits of PPOAs in the DOE Waste Minimization Pollution Prevention Crosscut Plan which states that the completion of opportunity assessments is of critical importance to DOE because they are an essential management decision-making tool that tell DOE: (1) how much waste and environmental releases can be avoided; (2) through what activity/process changes waste reduction can be achieved; (3) what it will cost to implement a pollution prevention opportunity; and (4) what will be the long-term savings in avoided waste management costs. Before exploring what a PPOA is, a brief discussion of pollution prevention is necessary. Pollution prevention (P2) may also be referred to as waste minimization, source reduction, and/or recycling. The definition used in the DOE-sponsored PPOA training class is: "Pollution prevention reduces or eliminates material releases to air, water, and/or land." The benefits of pollution prevention include a proactive approach to waste management, compliance issues, and liability concerns; economic incentives; improved employee and public health; and environmental stewardship. Basically it all boils down to the phrase, "It's the right thing to do."

14996 (KFK–5384) **Transmutation of long-lived minor actinides and fission products by accelerated protons.** Segev, M. (Kernforschungszentrum Karlsruhe GmbH (Germany)); Kuesters, H.; Pelloni, S. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung. Dec 1994. 55p. Order Number DE95769845. Source: OSTI; NTIS (US Sales Only); INIS.

In this report a methodology is developed to describe theoretically the transmutation of minor actinides (MA) with the help of an accelerator driven subcritical fuel region with high energetic protons of 1.6 GeV and a current of about 100 mA. This methodology is applied to a PHOENIX-type arrangement of fuel containing minor actinides as Am, Np and also long-lived fission products as ^{129}I and ^{99}Tc. It is shown that the MA are burnt effectively in such an arrgangement. A balance of the needed energy is made including the energy, given to the net. (orig.)

14997 (KTM/E-B–184) **Publicly administrated nuclear waste management research programme 1994-1996. General plan for the research programme and research plan for 1994.** Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. 1994. 46p. Order Number DE95628824. Source: OSTI; NTIS; INIS.

The nuclear energy legislation of Finland includes detailed stipulations concerning nuclear waste management. Each producer of nuclear waste is responsible for the safe handling, management and disposal of the waste, and for the financing of these operations. The authorities supervise and control the implementation of the national waste management programme and set the necessary safety and other requirements. The principal goal of the JYT programme is to provide the authorities with information and research

results relevant for the safety of nuclear waste management in order to support the various activities of the authorities. The whole field of the research programme is subdivided into the following main topic areas: (1) bedrock structure and stability, rock investigation methods, and characteristics and flow of groundwater, (2) release of radionuclides from a repository and subsequent migration in the bedrock, (3) performance and safety assessment of repositories and other phases of nuclear waste management (4) natural analogue studies, (5) waste management technology and costs and (6) sociopolitical and other societal issues and environmental impact assessment.

14998 (LA–12908-MS) **Status of volcanism studies for the Yucca Mountain Site Characterization Project.** Crowe, B. (Los Alamos National Lab., NM (United States)); Perry, F.; Murrell, M.; Poths, J.; Valentine, G.A.; Wells, S.; Bowker, L.; Finnegan, K.; Geissman, J.; McFadden, L. Los Alamos National Lab., NM (United States). Feb 1995. 396p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009090. Source: OSTI; NTIS; INIS; GPO Dep.

Chapter 1 introduces the volcanism issue for the Yucca Mountain site and provides the reader with an overview of the organization, content, and significant conclusions of this report. The risk of future basaltic volcanism is the primary topic of concern including both events that intersect a potential repository and events that occur near or within the waste isolation system of a repository. Chapter 2 describes the volcanic history of the Yucca Mountain region (YMR) and emphasizes the Pliocene and Quaternary volcanic record, the interval of primary concern for volcanic risk assessment. The Lathrop Wells volcanic center is described in detail because it is the youngest basalt center in the YMR. Chapter 3 describes the tectonic setting of the YMR and presents and assesses the significance of multiple alternative tectonic models. Geophysical data are described for the YMR and are used as an aid to understand the distribution of basaltic volcanic centers. Chapter 4 discusses the petrologic and geochemical features of basaltic volcanism in the YMR, the southern Great Basin and the Basin and Range province. The long time of activity and characteristic small volume of the Postcaldera basalt of the YMR result in one of the lowest eruptive rates in a volcanic field in the southwest United States. Chapter 5 summarizes current concepts of the segregation, ascent, and eruption of basalt magma. Chapter 6 summarizes the history of volcanism studies (1979 through early 1994), including work for the Yucca Mountain Site Characterization Project and overview studies by the state of Nevada and the Nuclear Regulatory Commission. Chapter 7 summarizes probabilistic volcanic hazard assessment using a three-part conditional probability model. Chapter 8 describes remaining volcanism work judged to be needed to complete characterization studies for the YMR. Chapter 9 summarizes the conclusions of this volcanism status report.

14999 (LA-SUB–95-42) **ABC Technology Development Program.** Los Alamos National Lab., NM (United States). 14 Oct 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009040. Source: OSTI; NTIS; INIS; GPO Dep.

The Accelerator-Based Conversion (ABC) facility will be designed to accomplish the following mission: 'Provide a weapon's grade plutonium disposition capability in a safe, economical, and environmentally sound manner on a prudent schedule for [50] tons of weapon's grade plutonium to be disposed on in [20] years.' This mission is supported by four major objectives: provide a reliable plutonium disposition capability within the next [15] years; provide a level of safety and of safety assurance that meets or exceeds that afforded to the public by modern commercial nuclear power plants; meet or exceed all applicable federal, state, and local regulations or standards for environmental compliance; manage the program in a cost effective manner. The ABC Technology Development Program defines the technology development activities that are required to accomplish this mission. The technology development tasks are related to the following topics: blanket system; vessel systems; reactivity control systems; heat transport system components; energy conversion systems; shutdown heat transport systems components; auxiliary systems; technology demonstrations - large scale experiments.

15000 (LA-UR–94-2018) **Waste gas combustion in a Hanford radioactive waste tank.** Travis, J.R.; Fujita, R.K.; Spore, J.W. Los Alamos National Lab., NM (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941102–3: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE94014290. Source: OSTI; NTIS; INIS; GPO Dep.

It has been observed that a high-level radioactive waste tank generates quantities of hydrogen, ammonia, nitrous oxide, and nitrogen that are potentially well within flammability limits. These gases are produced from chemical and nuclear decay reactions in a slurry of radioactive waste materials. Significant amounts of combustible and reactant gases accumulate in the waste over a 110- to 120-d period. The slurry becomes Taylor unstable owing to the buoyancy of the gases trapped in a matrix of sodium nitrate and nitrite salts. As the contents of the tank roll over, the generated waste gases rupture through the waste material surface, allowing the gases to be transported and mixed with air in the cover-gas space in the dome of the tank. An ignition source is postulated in the dome space where the waste gases combust in the presence of air resulting in pressure and temperature loadings on the double-walled waste tank. This analysis is conducted with hydrogen mixing studies HMS, a three-dimensional, time-dependent fluid dynamics code coupled with finite-rate chemical kinetics. The waste tank has a ventilation system designed to maintain a slight negative gage pressure during normal operation. We modeled the ventilation system with the transient reactor analysis code (TRAC), and we coupled these two best-estimate accident analysis computer codes to model the ventilation system response to pressures and temperatures generated by the hydrogen and ammonia combustion.

15001 (LA-UR–95-90) **Characterization of low level mixed waste at Los Alamos National Laboratory.** Hepworth, E. (Santa Fe Engineering, Ltd. (United States)); Montoya, A.; Holizer, B. Los Alamos National Lab., NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9503102–2: Waste management symposia, Tucson, AZ (United States), 1 Mar 1995). Order Number DE95006334. Source: OSTI; NTIS; INIS; GPO Dep.

The characterization program was conducted to maintain regulatory compliance and support ongoing waste treatment and disposal activities. The characterization team conducted a characterization review of wastes stored at the Laboratory that contain both a low-level radioactive and a hazardous component. The team addressed only those wastes generated before January 1993. The wastes reviewed, referred to as legacy wastes, had been generated before the implementation of comprehensive waste acceptance documentation procedures. The review was performed to verify existing RCRA code assignments and was required as part of the Federal Facility Compliance Agreement (FFCA). The review entailed identifying all legacy LLMW items in storage, collecting existing documentation, contacting and interviewing generators, and reviewing code assignments based upon information from knowledge of process (KOP) as allowed by RCRA. The team identified 7,546 legacy waste items in the current inventory, and determined that 4,200 required further RCRA characterization and documentation. KOP characterization was successful for accurately assigning RCRA codes for all but 117 of the 4,200 items within the scope of work. As a result of KOP interviews, 714 waste items were determined to be non-hazardous, while 276 were determined to be non-radioactive. Other wastes were stored as suspect radioactive. Many of the suspect radioactive wastes were certified by the generators as non-radioactive and will eventually be removed.

15002 (LA-UR–95-113) **Potential chemical hazards during retrieval of TRU waste drums.** Kosiewicz, S.T.; Thomas, C.C. Jr.; Sasser, M.K.; Foxx, C.L.; Gruetzmacher, K.M. Los Alamos National Lab., NM (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950601–5: Annual meeting of the American Nuclear Society, Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95006296. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory is implementing a program to retrieve a large number of transuranic (TRU) waste containers retrievably stored under earthen cover on three pads. The waste containers will be inspected and overpacked or repackaged as necessary. The majority of the containers are drums (> 16,000) and, as shown in Table 1,99.9% are 208-L (55-gal.) drums. The 208-L drums are reported to be of mild steel construction with removable lids and gaskets. The gaskets are believed to be permeable to hydrogen, but their permeability to volatile organic compounds (VOCS) is not known. As part of the retrieval operations, the drums will be penetrated and then fitted with a carbon-filter-containing venting device to ensure they do not contain flammable gases. A fully contained and high-efficiency air particulate (HEPA) filtered venting system with gas analysis capability for insertion of the vent device has been designed and is being constructed. A Hazards Analysis (HA) has been performed on the system to identify and evaluate potential accidents arising from the operation of the drum venting system.

15003 (LA-UR–95-213) **The physics design of accelerator-driven transmutation systems.** Venneri, F. Los Alamos National Lab., NM (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950777–1: Accelerator-driven transmutation technology (ADTT) conference, Las Vegas, NV (United States), 24-29 Jul 1995). Order Number DE95006293. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear systems under study in the Los Alamos Accelerator-Driven Transmutation Technology program (ADTT) will allow the destruction of nuclear spent fuel and weapons-return plutonium, as well as the production of nuclear energy from the thorium cycle, without a long-lived radioactive waste stream. The subcritical systems proposed represent a radical departure from traditional nuclear concepts (reactors), yet the actual implementation of ADTT systems is based on modest extrapolations of existing technology. These systems strive to keep the best that the nuclear technology has developed over the years, within a sensible conservative design envelope and eventually manage to offer a safer, less expensive and more environmentally sound approach to nuclear power.

15004 (LA-UR–95-817) **Introduction to spallation physics and spallation-target design.** Russell, G.J.; Pitcher, E.J.; Daemen, L.L. Los Alamos National Lab., NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950777–2: Accelerator-driven transmutation technology (ADTT) conference, Las Vegas, NV (United States), 24-29 Jul 1995). Order Number DE95007840. Source: OSTI; NTIS; INIS; GPO Dep.

When coupled with the spallation process in appropriate target materials, high-power accelerators can be used to produce large numbers of neutrons, thus providing an alternate method to the use of nuclear reactors for this purpose. Spallation offers exciting new possibilities for generating intense neutron fluxes for a variety of applications, including: (a) spallation-neutron sources for materials science research; (b) accelerator-based production of tritium; (c) accelerator-based transmutation of waste; (d) accelerator-based destruction of plutonium; and (e) radioisotope production for medical and energy applications. Target design plays a key role in these applications, with neutron production/leakage being strongly dependent on the incident particle type and energy, and target material and geometry.

15005 (LA-UR–95-1096) **Accelerator-based conversion (ABC) of weapons plutonium: Plant layout study and related design issues.** Cowell, B.S. (Oak Ridge National Lab., TN (United States)); Fontana, M.H.; Krakowski, R.A.; Beard, C.A.; Buksa, J.J.; Davidson, J.W.; Sailor, W.C.; Williamson, M.A. Los Alamos National Lab., NM (United States). [1995]. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009491. Source: OSTI; NTIS; INIS; GPO Dep.

In preparation for and in support of a detailed R and D Plan for the Accelerator-Based Conversion (ABC) of weapons plutonium, an ABC Plant Layout Study was conducted at the level of a pre-conceptual engineering design. The plant layout is based on an adaptation of the Molten-Salt Breeder Reactor (MSBR) detailed conceptual design that was completed in the early 1070s. Although the ABC Plant Layout Study included the Accelerator Equipment as an essential element, the engineering assessment focused primarily on the Target; Primary System (blanket and all systems containing plutonium-bearing fuel salt); the Heat-Removal System (secondary-coolant-salt and supercritical-steam systems); Chemical Processing; Operation and Maintenance; Containment and Safety; and Instrumentation and Control systems. Although constrained primarily to a reflection of an accelerator-driven (subcritical) variant of MSBR system, unique features and added flexibilities of the ABC suggest improved or alternative approaches to each of the above-listed subsystems; these, along with the key technical issues in need of resolution through a detailed R&D plan for ABC are described on the bases of the "strawman" or "point-of-departure" plant layout that resulted from this study.

15006 (LBL-PUB–5254(1994)) **Radioactive and mixed waste management plan for the Lawrence Berkeley Laboratory Hazardous Waste Handling Facility.** Lawrence Berkeley Lab., CA (United States). Jan 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95006594. Source: OSTI; NTIS; INIS; GPO Dep.

This Radioactive and Mixed Waste Management Plan for the Hazardous Waste Handling Facility at Lawrence Berkeley Laboratory is written to meet the requirements for an annual report of radioactive and mixed waste management activities outlined in DOE Order 5820.2A. Radioactive and mixed waste management activities during FY 1994 listed here include principal regulatory and environmental issues and the degree to which planned activities were accomplished.

15007 (NUREG/CR–4918-Vol.8) **Control of water infiltration into near surface LLW disposal units. Progress report on field experiments at a humid region site, Beltsville, Maryland: Volume 8.** Schulz, R.K. (California Univ., Los Angeles, CA (United States)); Ridky, R.W.; O'Donnell, E. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; California Univ., Los Angeles, CA (United States); Maryland Univ., College Park, MD (United States). Dept. of Geology. Apr 1995. 21p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This study's objective is to assess means for controlling water infiltration through waste disposal unit covers in humid regions. Experimental work is being performed in large-scale lysimeters 21.34 m x 13.72 m x 3.05 m (75 ft x 45 ft x 10 ft) at Beltsville, Maryland. Results of the assessment are applicable to disposal of low-level radioactive waste (LLW), uranium mill tailings, hazardous waste, and sanitary landfills. Three kinds of waste disposal unit covers or barriers to water infiltration are being investigated: (1) resistive layer barrier, (2) conductive layer barrier, and (3) bioengineering management. The resistive layer barrier consists of compacted earthen material (e.g., clay). The conductive layer barrier consists of a conductive layer in conjunction with a capillary break. As long as unsaturated flow conditions are maintained, the conductive layer will wick water around the capillary break. Below-grade layered covers such as (1) and (2) will fail if there is appreciable subsidence of the cover, and remedial action for this kind of failure will be difficult. A surface cover, called bioengineering management, is meant to overcome this problem. The bioengineering management surface barrier is easily repairable if damaged by subsidence; therefore, it could be the system of choice under active subsidence conditions. The bioengineering management procedure also has been shown to be effective in dewatering saturated trenches and could be used for remedial action efforts. After cessation of subsidence, that procedure could be replaced by a resistive layer barrier or, perhaps even better, by a resistive layer barrier/conductive layer barrier system. The latter system would then give long-term effective protection against water entry into waste without institutional care.

15008 (NUREG/CR–6283) **Field site investigation: Effect of mine seismicity on groundwater hydrology.** Ofoegbu, G.I. (Southwest Research Inst., San Antonio, TX (United States). Center for Nuclear Waste Regulatory Analyses); Hsiung, S.; Chowdhury, A.H.; Philip, J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications;

Southwest Research Inst., San Antonio, TX (United States). Center for Nuclear Waste Regulatory Analyses. Apr 1995. 101p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (CNWRA–94-017). Source: OSTI; NTIS; GPO; INIS.

The results of a field investigation on the groundwater-hydrologic effect of mining-induced earthquakes are presented in this report. The investigation was conducted at the Lucky Friday Mine, a silver-lead-zinc mine in the Coeur d'Alene Mining District of Idaho. The groundwater pressure in sections of three fracture zones beneath the water table was monitored over a 24-mo period. The fracture zones were accessed through a 360-m-long inclined borehole, drilled from the 5,700 level station of the mine. The magnitude, source location, and associated ground motions of mining-induced seismic events were also monitored during the same period, using an existing seismic instrumentation network for the mine, augmented with additional instruments installed specifically for the project by the center for Nuclear Waste Regulatory Analyses (CNWRA). More than 50 seismic events of Richter magnitude 1.0 or larger occurred during the monitoring period. Several of these events caused the groundwater pressure to increase, whereas a few caused it to decrease. Generally, the groundwater pressure increased as the magnitude of seismic event increased; for an event of a given magnitude, the groundwater pressure increased by a smaller amount as the distance of the observation point from the source of the event increased. The data was examined using regression analysis. Based on these results, it is suggested that the effect of earthquakes on groundwater flow may be better understood through mechanistic modeling. The mechanical processes and material behavior that would need to be incorporated in such a model are examined. They include a description of the effect of stress change on the permeability and water storage capacity of a fracture rock mass; transient fluid flow; and the generation and transmission of seismic waves through the rock mass.

15009 (ORNL/ER–280) **Annual summary report of the Decontamination and Decommissioning Surveillance and Maintenance Program at Oak Ridge National Laboratory for period ending September 30, 1994.** Anderson, L.A. (comp.); Burwinkle, T.W.; Ford, M.K.; Gaddis, H.R.; Holder, L. Jr.; Mandry, G.J.; Nelson, T.R.; Patton, B.D. Oak Ridge National Lab., TN (United States). Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009999. Source: OSTI; NTIS; INIS; GPO Dep.

The Surplus Facilities Management Program (SFMP) was established at Oak Ridge National Laboratory (ORNL) in 1976 to provide collective management of all surplus sites under ORNL's control on the Oak Ridge Reservation. Presently, over 50 facilities, grouped into projects, are currently managed by the Decontamination and Decommissioning Program, the successor program to the SFMP. Support includes (1) surveillance and maintenance planning; (2) routine surveillance and maintenance; and (3) special maintenance projects. This report documents routine surveillance and maintenance, special projects, and special maintenance performed on these facilities for the period of October 1993 through September 1994.

15010 (ORNL/ER–290) **Wet season reconnaissance report on Seeps and Springs in Waste Area Grouping 6 at Oak Ridge National Laboratory. Environmental Restoration Program.** Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Feb 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010053. Source: OSTI; NTIS; GPO Dep.

As part of the Environmental Monitoring Plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee (DOE, 1993), seep and spring identification at WAG 6 is required. The Environmental Monitoring Plan requires the determination and monitoring of contaminant flux into and out of WAG 6. Part of the monitoring is accomplished through surface water monitoring stations and groundwater monitoring wells; however, these monitoring locations do not completely monitor all areas in WAG 6. Seeps and springs are known to exist within and around WAG 6. These seeps and springs can be used to provide; (1) additional monitoring data for near surface water/groundwater monitoring locations and (2) monitoring data for seep/spring locations where surface water/groundwater monitoring is not feasible. The identification and location of seeps and springs in and around the WAG 6 area were required to provide these data points. The location and identification of seeps and springs is referred to as a seep and spring reconnaissance. The reconnaissance for the WAG 6 area was conducted in accordance with Seep and Spring Reconnaissance Plan for Waste Area Grouping 6, (ECE, 1993). The plan required two reconnaissance efforts in order to compare and contrast seasonal effects on the seeps and springs. Both a dry season (August through October) and a wet season (November through mid-April) reconnaissance were performed. The plan required the identification of seep/spring locations under antecedent conditions of less than 0.1 inch of rainfall in the preceding 72 hours. The reconnaissance plan required that groundwater discharge (seeps and springs) locations be: visually identified, photographed, marked and numbered, and described. In addition, surface radiologic, volatile organic chemical measurements and estimated flow rate measurements were determined at each identified seep.

15011 (ORNL/TM–12900) **Contaminated nickel scrap processing.** Compere, A.L.; Griffith, W.L.; Hayden, H.W.; Johnson, J.S. Jr.; Wilson, D.F. Oak Ridge National Lab., TN (United States). Dec 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009063. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE will soon choose between treating contaminated nickel scrap as a legacy waste and developing high-volume nickel decontamination processes. In addition to reducing the volume of legacy wastes, a decontamination process could make 200,000 tons of this strategic metal available for domestic use. Contaminants in DOE nickel scrap include ^{234}Th, ^{234}Pa, ^{137}Cs, ^{239}Pu (trace), ^{60}Co, U, ^{99}Tc, and ^{237}Np (trace). This report reviews several industrial-scale processes – electrorefining, electrowinning, vapormetallurgy, and leaching – used for the purification of nickel. Conventional nickel electrolysis processes are particularly attractive because they use side-stream purification of process solutions to improve the purity of nickel metal. Additionally, nickel purification by electrolysis is effective in a variety of electrolyte systems, including sulfate, chloride, and nitrate. Conventional electrorefining processes typically use a mixed electrolyte which includes sulfate, chloride, and borate. The use of an electrorefining or electrowinning system for scrap nickel recovery could be combined effectively with a variety of processes, including cementation, solvent extraction, ion exchange, complex-formation, and surface sorption, developed for uranium and transuranic purification. Selected processes were reviewed and evaluated for use in nickel side-stream purification. 80 refs.

15012 (ORNL/TM–12908) **Analysis of source term modeling for low-level radioactive waste performance assessments.** Icenhour, A.S. Oak Ridge National Lab., TN (United States). Mar 1995. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009657. Source: OSTI; NTIS; INIS; GPO Dep.

Site-specific radiological performance assessments are required for the disposal of low-level radioactive waste (LLW) at both commercial and US Department of Energy facilities. This work explores source term modeling of LLW disposal facilities by using two state-of-the-art computer codes, SOURCE1 and SOURCE2. An overview of the performance assessment methodology is presented, and the basic processes modeled in the SOURCE1 and SOURCE2 codes are described. Comparisons are made between the two advective models for a variety of radionuclides, transport parameters, and waste-disposal technologies. These comparisons show that, in general, the zero-order model predicts undecayed cumulative fractions leached that are slightly greater than or equal to those of the first-order model. For long-lived radionuclides, results from the two models eventually reach the same value. By contrast, for short-lived radionuclides, the zero-order model predicts a slightly higher undecayed cumulative fraction leached than does the first-order model. A new methodology, based on sensitivity and uncertainty analyses, is developed for predicting intruder scenarios. This method is demonstrated for ^{137}Cs in a tumulus-type disposal

facility. The sensitivity and uncertainty analyses incorporate input-parameter uncertainty into the evaluation of a potential time of intrusion and the remaining radionuclide inventory. Finally, conclusions from this study are presented, and recommendations for continuing work are made.

15013 (ORNL/TM–12910) **Mercury removal from aqueous mixed waste.** Klasson, K.T.; Perona, J.J.; Corder, S.L. Oak Ridge National Lab., TN (United States). Mar 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009926. Source: OSTI; NTIS; GPO Dep.

Large volumes of mercury-contaminated wastes are stored on U.S. Department of Energy (DOE) I sites. The mixed wastes contain sufficient radioactivity and hazardous materials that they must be handled under both the Atomic Energy Act and the Resource Conservation and Recovery Act. New, inexpensive, and improved separation methods are needed for treating a wide variety of mixed wastes at many DOE facilities. Volatile mercury should be removed from aqueous wastes before potential water evaporation and thermal treatment. For some solids, innovative methods such as selective leaching are being developed and there is a need for secondary treatment or regeneration of the leachate liquids. Laboratory work was performed in order to investigate the possibility of using inexpensive sulfur-impregnated, activated-carbon pellets (Mersorb®) to remove mercury from aqueous waste. The desired goal was to generate engineering-scale data so that the mercury could be separated (removed) from aqueous streams or reliably accounted for in the development of overall treatment strategies for mixed wastes. Laboratory studies demonstrated that mercury could be removed to levels below the current Environmental Protection Agency toxic characteristic level (0.2 ppm) when Mersorb was used under a variety of operating conditions. When comparing the use of the inexpensive Mersorb with the more expensive ion exchanger, Duolite GT-73, the Mersorb had favorable process economics; however, further testing and economic analysis is required before making final conclusions. The target wastes were selected by obtaining mixed waste inventories for several DOE sites, evaluating the wastes against a set of seven criteria, and by contacting Mixed Waste Integrated Program representatives at the sites to discuss tentative target wastes.

15014 Storage of nuclear materials by encapsulation in fullerenes. Coppa, N.V. To Dept. of Energy. 1993. Filed date 30 Mar 1993. U.S. Patent Application 8-039,668. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009989. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A method is disclosed for encapsulating radioactive materials inside fullerenes for stable long-term storage. Fullerenes provide a safe and efficient means of disposing of nuclear waste which is extremely stable with respect to the environment. After encapsulation, a radioactive ion is essentially chemically isolated from its external environment.

15015 (PNL–10497) **Product consistency testing of three reference glasses in stainless steel and perfluoroalkoxy resin vessels.** Olson, K.M.; Smith, G.L.; Marschman, S.C. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010324. Source: OSTI; NTIS; INIS; GPO Dep.

Because of their chemical durability, silicate glasses have been proposed and researched since the mid-1950s as a medium for incorporating high-level radioactive waste (HLW) generated from processing of nuclear materials. A number of different waste forms were evaluated and ranked in the early 1980s; durability (leach resistance) was the highest weighted factor. Borosilicate glass was rated the best waste form available for incorporation of HLW. Four different types of vessels and three different glasses were used to study the possible effect of vessel composition on durability test results from the Production Consistency Test (PCT). The vessels were 45-m 304 stainless steel vessels, 150-m 304 L stainless steel vessels, and 60-m perfluoroalkoxy (PFA) fluoropolymer resin vessels. The three glasses were the Environmental Assessment glass manufactured by Corning Incorporated and supplied by Westinghouse Savannah River company, and West Valley Nuclear Services reference glasses 5 and 6, manufactured and supplied by Catholic University of America. Within experimental error, no differences were found in durability test results using the 3 different glasses in the 304L stainless steel or PFA fluoropolymer resin vessels over the seven-day test period.

15016 (PNL–10503) **Computer simulation of mobilization and mixing of kaolin with submerged liquid jets in 25,000-gallon horizontal cylindrical tanks.** Eyler, L.L.; Mahoney, L.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009570. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents and analyzes results of computer model simulation of mobilization and mixing of kaolin using the TEMPEST code. The simulations are conducted in a horizontal cylindrical geometry replicating a 95 m^3 (25,000 gal) test tank at ORNL, which is scaled to approximate Melton Valley Storage tanks, which are 190 m^3 (50,000 gal). Mobilization and mixing is accomplished by two submerged liquid jets. Two configurations are simulated, one with the jets located at the center of the tank lengthwise and one with the jets located 1/4 tank length from one end. Computer simulations of both jet and suction configurations are performed. Total flow rates of 50, 100, and 200 gpm are modeled, corresponding to jet velocities of 1.52, 3.05, 6.10 m/s (5, 10, 20 ft/s). Calculations were performed to a time of 2 h for the center jet location and to a little over 1 h for the quarter jet location. This report presents computer and fluid properties model basis, preliminary numerical testing, and results. The results are presented in form of flow field and sludge layer contours. Degree of mobilization is presented as fraction of initial sludge layer remaining as a function of time. For the center jet location at 200 gpm, the sludge layer is completely mobilized in just over 1 h. For 100 gpm flow, about 5% of the sludge layer remains after 2 h. For 50 gpm flow, nearly 40% of the initial sludge layer remains after 2 h. For the quarter jets at 200 gpm, about 10% of the initial sludge layer remains after 1 h. For 100 gpm, about 40% of the sludge layer remains after 1 h. The boundary of the sludge layer is defined as 98% max packing for the particles. Mixing time estimates for these cases range from between 9.4 h and 16.2 h. A more critical evaluation and comparison of predictions and the test results is needed.

15017 (PNL–10508) **Estimation of natural ground water recharge for the performance assessment of a low-level waste disposal facility at the Hanford Site.** Rockhold, M.L.; Fayer, M.J.; Kincaid, C.T.; Gee, G.W. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010323. Source: OSTI; NTIS; INIS; GPO Dep.

In 1994, the Pacific Northwest Laboratory (PNL) initiated the Recharge Task, under the PNL Vitrification Technology Development (PVTD) project, to assist Westinghouse Hanford Company (WHC) in designing and assessing the performance of a low-level waste (LLW) disposal facility for the US Department of Energy (DOE). The Recharge Task was established to address the issue of ground water recharge in and around the LLW facility and throughout the Hanford Site as it affects the unconfined aquifer under the facility. The objectives of this report are to summarize the current knowledge of natural ground water recharge at the Hanford Site and to outline the work that must be completed in order to provide defensible estimates of recharge for use in the performance assessment of this LLW disposal facility. Recharge studies at the Hanford Site indicate that recharge rates are highly variable, ranging from nearly zero to greater than 100 mm/yr depending on precipitation, vegetative cover, and soil types. Coarse-textured soils without plants yielded the greatest recharge. Finer-textured soils, with or without plants, yielded the least. Lysimeters provided accurate, short-term measurements of recharge as well as water-balance data for the soil-atmosphere interface and root zone. Tracers provided estimates of longer-term average recharge rates in undisturbed settings. Numerical models demonstrated the sensitivity of recharge rates to different processes and forecast recharge rates for different conditions. All of these tools (lysimetry, tracers,

and numerical models) are considered vital to the development of defensible estimates of natural ground water recharge rates for the performance assessment of a LLW disposal facility at the Hanford Site.

15018 (PNL–10512) **Sludge pretreatment chemistry evaluation: Enhanced sludge washing separation factors.** Colton, N.G. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010325. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the work conducted in Fiscal Year 1994 by the Sludge Pretreatment Chemistry Evaluation Subtask for the Tank Waste Remediation System (TWRS) Tank Waste Treatment Science Task. The main purpose of this task, is to provide the technical basis and scientific understanding to support TWRS baseline decisions and actions, such as the development of an enhanced sludge washing process to reduce the volume of waste that will require high-level waste (HLW) vitrification. One objective within the Sludge Pretreatment Chemistry Evaluation Subtask was to establish wash factors for various SST (single-shell tank) sludges. First, analytical data were compiled from existing tank waste characterization reports. These data were summarized on tank-specific worksheets that provided a uniform format for reviewing and comparing data, as well as the means to verify whether the data set for each tank was complete. Worksheets were completed for 27 SST wastes. The analytical water wash data provided tank-specific information about the fraction of each component that dissolves with water, i.e., an estimate of tank-specific wash factors for evaluating tank-by-tank processing. These wash data were then used collectively to evaluate some of the wash factors that are assumed for the overall SST waste inventory; specifically, wash factors for elements that would be found primarily in sludges. The final step in this study was to incorporate the characterization and wash factor data into a spreadsheet that provides insight into the effect of enhanced sludge washing on individual tank sludges as well as for groups of sludges that may be representative of different waste types. Spreadsheet results include the estimated mass and percentage of each element that would be removed with washing and leaching. Furthermore, estimated compositions are given of the final wash and leach streams and residual solids, in terms of both concentration and dry weight percent.

15019 (PNL-SA–24451) **Membrane mediated separation of tritiated water from water without phase change.** Nelson, D.A.; Duncan, J.B.; Jensen, G.A.; Burton, S.D. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941102–43: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95007810. Source: OSTI; NTIS; INIS; GPO Dep.

This development effort at the Pacific Northwest Laboratory (PNL) has been directed toward the separation of tritium (via ^{3}HOH or HTO) from contaminated ground water with the use of membrane technology. Tritium contamination exists in both aquifers and water used for reactor cooling and represents both a technical and financial challenge for the Department of Energy. Currently, the primary option for the remediation low-level tritium is migration with time through geological formations. However, point sources containing tritiated water can be attacked by separation technology, thus directly addressing environmental concerns. The separation technology reported here is especially applicable to tritium contaminated water generated in nuclear fuel storage basins. At Hanford, the dual K-Basins contain 1000 metric tons of fuel with cooling waters; the K-East Basin contains 5.7 million liters of water at 11.1 MBq (3 μCi/L). The K-West Basin contains 300,000 pCi/L also due to canister leakage. At the Savannah River Site, the L-Reactor Basin (15.2 million liters of water) and K-Reactor Disassembly Basins have held fuel rods for 5 years and many have corroded. Tritium levels are near that of the Hanford basins. At INEL, Building 603 stores more than 13,200 Kg of fuel rods in three pools of lesser volume than the Hanford or Savannah River Sites. Experience with membrane systems in industry indicates that they are inherently energy efficient. In the work at PNL, aromatic polyphosphazenes were chosen as the polymeric material for the membranes being investigated because they have been shown to possess excellent isothermal stability above 300°C and are quite robust under radiolysis conditions.

15020 (PNL-SA–24936) **Integration of pneumatic fracturing and in situ vitrification in the soil subsurface.** Luey, J. (Pacific Northwest Lab., Richland, WA (United States)); Seiler, D.K.; Schuring, J.R. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216–86: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009121. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory is evaluating ways to increase the applicability of the in situ vitrification (ISV) process at hazardous and radioactive waste sites. One innovation is the placement of a conductive material that will facilitate initiating the ISV process at a target depth. A series of laboratory tests performed at the New Jersey Institute of Technology (NJIT) assessed the feasibility of pneumatic fracturing (PF) in the highly permeable soils of the Hanford Site. The NJIT tests included an analysis of Hanford soils, a series of PF injection tests, and a parametric analysis to determine how soil properties affect the PF process. Results suggest that the PF process can be applied to Hanford soils and that dry medium (e.g., conductive material such as graphite flake) can be injected into the fracture. This paper describes the laboratory testing performed at NJIT, its results, and the application of those results to plans for a field demonstration at Hanford.

15021 (PNL-SA–25590) **An electronic design guideline for incorporating pollution prevention into U.S. Department of Energy design projects.** Greitzer, F.L. (Pacific Northwest Lab., Richland, WA (United States)); Brown, B.W.; Dorsey, J.A.; Stitzel, J.C.; Raney, E.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9503128–1: 1. international plant operations and design conference, Houston, TX (United States), 21-23 Mar 1995). Order Number DE95008935. Source: OSTI; NTIS; GPO Dep.

The Pacific Northwest Laboratory has developed a prototype pollution prevention electronic design guideline (EDG) for the U.S. Department of Energy (DOE), Waste Minimization Division (EM-334). The EDG contains a database of 267 opportunities to incorporate pollution prevention features into DOE design projects. Each opportunity provides supporting data that help the decisionmaker (designers, engineers, and project managers) evaluate the applicability and potential benefits of implementing pollution prevention in their particular project. The EDG's database was derived from both DOE and non-DOE sources including pollution prevention literature, industrial design personnel, and federal, state, and DOE sources. A key feature of the tool is the integration of photos, illustrations, and documentation to provide easy access to technical information on specific waste minimization opportunities in design. Historically, pollution prevention activities within the U.S. Department of Energy (DOE) have focused on existing process waste streams. However, it is estimated that 70% of the cost over the life of a product is fixed by design (i.e., before the product is constructed or used). In recognition of this pollution prevention opportunity, the DOE has funded the Hanford Site to incorporate it into the design of new products, processes, and facilities across the complex. Hanford Site contractors are now beginning their third year of leading this activity for DOE Headquarters (HQ).

15022 (PNL-SA–25649) **A Value of Information approach to data quality objectives for the Hanford high-level waste tanks.** Wood, T.W. (Pacific Northwest Lab., Richland, WA (United States)); Hunter, V.L.; Ulvila, J.W. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216–117: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008936. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes a Pacific Northwest Laboratory review of the organic-nitrate reaction safety issue in the Hanford single-shell tanks. This study employed a decision analytic method known as Value of Information (VOI). VOI analysis is a special form of decision analysis that has an information collection alternative as one

of the initial decision choices. This type of decision analysis, therefore results in the ability to specify the preferred information collection alternative, taking into account all information gathering and other relevant alternatives. For example, the risk reduction benefit associated with further sampling to quantify total organic carbon inventory or to improve information on energetics can be compared to the risk reduction benefit of better temperature monitoring, operational restrictions, or mitigation by moisture control. This approach allows freedom from built-in assumptions, e.g., that all tanks must be sampled to some degree or that all tanks must be deemed intrinsically safe by some means or another. It allows for each tank management decision to be judged in terms of risk reduction from the current state of affairs, and for that state of affairs to be continuously updated to incorporate new information on tank contents, the phenomenology of safety issues, or the effectiveness of mitigation schemes.

15023 (RFP–4927) **Microwave waste processing technology overview.** Sprenger, G.S. (EG and G Rocky Flats, Inc., Golden, CO (United States)); Petersen, R.D. EG and G Rocky Flats, Inc., Golden, CO (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE95010273. Source: OSTI; NTIS; INIS; GPO Dep.

Applications using microwave energy in the chemical processing industry have increased within the last ten years. Recently, interest in waste treatment applications process development, especially solidification, has grown. Microwave waste processing offers many advantages over conventional waste treatment technologies. These advantages include a high density, leach resistant, robust waste form, volume and toxicity reduction, favorable economics, in-container treatment, good public acceptance, isolated equipment, and instantaneous energy control. The results from the "cold" demonstration scale testing at the Rocky Flats nuclear weapons facility are described. Preliminary results for a transuranic (TRU) precipitation sludge indicate that volume reductions of over 80% are achievable over the current immobilization process. An economic evaluation performed demonstrated cost savings of $11.68 per pound compared to the immobilization process currently in use on wet sludge.

15024 (RFP–4928) **Analyses of vitrified waste.** Armentrout, D.L.; Carpenter, S.H. EG and G Rocky Flats, Inc., Golden, CO (United States). 19 Oct 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE95010275. Source: OSTI; NTIS; INIS; GPO Dep.

Surrogate wastes were melted in bench-scale microwave melter to evaluate glass frits. The ceramic crucibles were placed in 304 stainless steel cans and heated to 1300 C; during cooling, some of the crucibles broke, leaking the melt into the SS can. This report presents the findings of XRD, SEM, and energy dispersive x-ray analysis. It was found that: amorphous materials have the greatest homogeneity; measuring XRD is a good test of amorphous state; molten vitrified waste can absorb Cr from SS; and the vitrified waste is more durable than SiO_2.

15025 (SAND–92-2186) **Scenarios constructed for nominal flow in the presence of a repository at Yucca Mountain and vicinity.** Barr, G.E. (Sandia National Labs., Albuquerque, NM (United States)); Hunter, R.L.; Dunn, E.; Flint, A. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009315. Source: OSTI; NTIS; INIS; GPO Dep.

Scenario development for the system performance assessment of the Yucca Mountain Site Characterization Project defines a scenario as a well-posed problem connecting an initiating event with radionuclide release to the accessible environment by a logical and physically possible combination or sequence of features, events, and processes. Drawing on the advice and assistance of the Project's principal investigators (PIs), a collection of release scenarios initiated by the nominal ground-water flow occurring in the vicinity of the potential Yucca Mountain high-level-waste repository is developed and described in pictorial form. This collection of scenarios is intended to provide a framework to assist PIs in recognizing essential field and calculational analyses, to assist performance assessment in providing guidance to site characterization, and to continue the effort to exhaustively identify all features, events, and processes important to releases. It represents a step in the iterative process of identifying what details of the potential site are important for safe disposal. 67 refs.

15026 (SAND–93-3997) **A review of the available technologies for sealing a potential underground nuclear waste repository at Yucca Mountain, Nevada.** Fernandez, J.A. (Sandia National Labs., Albuquerque, NM (United States)); Richardson, A.M. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 420p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95008439. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to assess the availability of technologies to seal underground openings. The technologies are needed to seal the potential high-level radioactive waste repository at Yucca Mountain. Technologies are evaluated for three basic categories of seal components: backfill (general fill and graded fill), bulkheads, and grout curtains. Not only is placement of seal components assessed, but also preconditioning of the placement area and seal component durability. The approach taken was: First, review selected sealing case histories (literature searches and site visits) from the mining, civil, and defense industries; second, determine whether reasonably available technologies to seal the potential repository exist; and finally, identify deficiencies in existing technologies. It is concluded that reasonably available technologies do exist to place backfill, bulkheads, and grout curtains. Technologies also exist to precondition areas where seal components are to be placed. However, if final performance requirements are stringent for these engineered structures, some existing technologies may need to be developed. Deficiencies currently do exist in technologies that demonstrate the long-term durability and performance of seal components. Case histories do not currently exist that demonstrate the placement of seal components in greatly elevated thermal and high-radiation environments and in areas where ground support (rock bolts and concrete liners) has been removed. The as-placed, in situ material properties for sealing materials appropriate to Yucca Mountain are not available.

15027 (SAND–94-2134C) **Correlation of theoretical calculations and experimental measurements of damage around a shaft in salt.** Munson, D.E. (Sandia National Labs., Albuquerque, NM (United States)); Holcomb, D.J.; DeVries, K.L.; Brodsky, N.S.; Chan, K.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655–3: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95004525. Source: OSTI; NTIS; INIS; GPO Dep.

Cross-hole ultrasonic measurements were made in the immediate wall of the Air Intake Shaft of the Waste Isolation Pilot Plant facility. These measurements show that compressional wave speed markedly decreases at the shaft wall and then increases with radial distance from the shaft to eventually become that of solid or undamaged salt. This behavior is indicative of deformation damage or microfractures in the salt. These in situ data are compared to both laboratory measurements of wave speed as a function of volume dilatancy and to calculations based on the Multimechanism Deformation Coupled Fracture model, with reasonable agreement.

15028 (SAND–94-2135C) **A damage mechanics approach to life prediction for a salt structure.** Chan, K.S. (Southwest Research Inst., San Antonio, TX (United States)); Bodner, S.R.; DeVries, K.L.; Fossum, A.F.; Munson, D.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950788–4: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95007732. Source: OSTI; NTIS; INIS; GPO Dep.

Excavated rooms in natural bedded salt formations are being considered for use as repositories for nuclear waste. It is presumed that deformation of the rooms by creep will lead to loss of structural integrity and affect room life history and seal efficiency.

At projected repository temperatures, two possible fracture mechanisms in salt are creep-induced microcracking in triaxial compression and cleavage in tension. Thus, an accurate prediction of room life and seal degradation requires a reliable description of the creep and damage processes. While several constitutive models that treat either creep or fracture in salt are available in the literature, very few models have considered creep and damage in a coupled manner. Previously, Munson and Dawson formulated a set of creep equations for salt based on the consideration of dislocation mechanisms in the creep process. This set of creep equations has been generalized to include continuum, isotropic damage as a fully coupled variable in the response equation. The extended model has been referred to as the Multimechanism Deformation Coupled Fracture (MDCF) model. A set of material constants for the creep and damage terms was deduced based on test data for both clean and argillaceous salt. In this paper, the use of the MDCF model for establishing the failure criteria and for analyzing the creep response of a salt structure is demonstrated. The paper is divided into three parts. A summary of the MDCF model is presented first, which is followed by an evaluation of the MDCF model against laboratory data. Finally, finite-element calculations of the creep and damage response of a salt structure are presented and compared against in-situ field measurements.

15029 (SAND–94-2136C) **Constitutive representation of damage development and healing in WIPP salt.** Chan, K.S. (Southwest Research Inst., San Antonio, TX (United States)); Bodner, S.R.; Fossum, A.F; Munson, D.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655–2: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95004524. Source: OSTI; NTIS; INIS; GPO Dep.

There has been considerable interest in characterizing and modeling the constitutive behavior of rock salt with particular reference to long-term creep and creep failure. The interest is motivated by the projected use of excavated rooms in salt rock formations as repositories for nuclear waste. It is presumed that closure of those rooms by creep ultimately would encapsulate the waste material, resulting in its effective isolation. A continuum mechanics approach for treating damage healing is formulated as part of a constitutive model for describing coupled creep, fracture, and healing in rock salt. Formulation of the healing term is, described and the constitutive model is evaluated against experimental data of rock salt from the Waste Isolation Pilot Plant (WIPP) site. The results indicate that healing anistropy in WIPP salt can be modeled with an appropriate power-conjugate equivalent stress, kinetic equation, and evolution equation for damage healing.

15030 (SAND–94-2313C) **Dynamic compaction of salt: Initial demonstration and performance testing.** Hansen, F.D. (Sandia National Labs., Albuquerque, NM (United States)); Ahrens, E.H.; Tidwell, V.C.; Tillerson, J.R; Brodsky, N.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655–4: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95004776. Source: OSTI; NTIS; INIS; GPO Dep.

Reconsolidated crushed salt is proposed as the sole long-term shaft seal between the Waste Isolation Pilot Plant (WIPP) and the biosphere. The concept for a long-term shaft seal for the WIPP repository is to place crushed salt in the four shafts and to develop an effective seal as the surrounding salt creeps into the shafts, reconsolidating the salt. Permeability of the salt components is calculated to achieve performance objectives at some acceptable time in the future, an expectation which is a key to performance assessment calculations for the WIPP. Such a seal has never been constructed, and until now no performance measurements have been made on an appropriately large scale. A full understanding of construction methods, achievable initial density and permeability and time-wise performance of reconsolidating salt is required. This paper discusses nearly full-scale dynamic compaction of mine-run WIPP salt, preliminary measurements of density and permeability, and their variability within a relatively large volume of compacted material.

15031 (SAND–94-2343C) **The influence of crushed rock salt particle gradation on compaction.** Ran, C. (Univ. of Nevada, Reno, NV (United States)); Daemen, J.J.K. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950655–5: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95008436. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents results of laboratory compaction testing to determine the influence of particle size, size gradation and moisture-content on compaction of crushed rock salt. Included is a theoretical analysis of the optimum size gradation. The objective is to evaluate the relative densities that can be achieved with tamping techniques. Initial results indicate that compaction increases with maximum particle size and compaction energy, and varies significantly with article size gradation and water content.

15032 (SAND–95-0324C) **Assessing alternative conceptual models of fracture flow.** Ho, C.K. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–1: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95008819. Source: OSTI; NTIS; INIS; GPO Dep.

The numerical code TOUGH2 was used to assess alternative conceptual models of fracture flow. The models that were considered included the equivalent continuum model (ECM) and the dual permeability (DK) model. A one-dimensional, layered, unsaturated domain was studied with a saturated bottom boundary and a constant infiltration at the top boundary. Two different infiltration rates were used in the studies. In addition, the connection areas between the fracture and matrix elements in the dual permeability model were varied. Results showed that the two conceptual models of fracture flow produced different saturation and velocity profiles-even under steady-state conditions. The magnitudes of the discrepancies were sensitive to two parameters that affected the flux between the fractures and matrix in the dual permeability model: (1) the fracture-matrix connection areas and (2) the capillary pressure gradients between the fracture and matrix elements.

15033 (SAND–95-0437C) **Interactive development of RADTRAN.** Neuhauser, K.S. (Sandia National Labs., Albuquerque, NM (United States)); Kanipe, F.L.; Weiner, R.F.; Yoshimura, H.R.; Joy, H.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950216–78: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008530. Source: OSTI; NTIS; INIS; GPO Dep.

The RADTRAN computer code for transportation risk analysis, which has been under continuous development at Sandia National Laboratories since 1977, has evolved from a purely research tool into a publicly available with a variety of applications. This expansion of the user community has substantially increased the need to make the system easier to use without decreasing its capabilities or the quality of output. A large set of modifiable RADTRAN input files has been available via TRANSNET for several years. One approach to assisting the user involves adding annotations/information to each of these files. A second approach is providing additional help in building new/modifying old input files. Keeping the proposed information/annotation files separate from but closely coupled to the modifiable input files within the TRANSNET shell system allows the modifiable input files to remain as regular input files while providing rapid, automatic access to, useful information about the analysis. In this way, the sample input files remain intact as regular RADTRAN input files and any files generated using associated on-line menus or editors may be readily converted into new input files. A single sample file is selected and used as an example to illustrate the prototype help features.

15034 (SAND–95-0495) **Hazardous materials management using a Cradle-to-Grave Tracking and Information System (CGTIS).** Kjeldgaard, E. (Sandia National Labs., Albuquerque, NM (United States)); Fish, J.; Campbell, D.; Freshour, N.; Hammond, B.; Bray, O.; Hollingsworth, M. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 181p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009540. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous materials management includes interactions among materials, personnel, facilities, hazards, and processes of various groups within a DOE site's environmental, safety & health (ES&H) and line organizations. Although each group is charged with addressing a particular aspect of these properties and interactions, the information it requires must be gathered into a coherent set of common data for accurate and consistent hazardous material management and regulatory reporting. It is these common data requirements which the Cradle-to-Grave Tracking and Information System (CGTIS) is designed to satisfy. CGTIS collects information at the point at which a process begins or a material enters a facility, and maintains that information, for hazards management and regulatory reporting, throughout the entire life-cycle by providing direct on-line links to a site's multitude of data bases to bring information together into one common data model.

15035 (SAND–95-0564C) **Using TOUGH2 to model the coupled effects of gas generation, repository consolidation, and multiphase brine and gas flow at the Waste Isolation Pilot Plant.** Freeze, G.A. (INTERA Inc., Albuquerque, NM (United States)); Larson, K.W.; Davies, P.B.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–5: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009592. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a US Department of Energy facility designed to demonstrate the safe underground disposal of transuranic waste. Following waste emplacement, each room will be backfilled with crushed salt. Due to deviatoric stress introduced by excavation, the walls of the waste disposal rooms in the repository will deform over time, consolidating waste containers and salt backfill, thereby decreasing the void volume of the repository. Long-term repository assessment must consider the processes of gas generation, room closure and expansion due to salt creep, and multiphase (brine and gas) fluid flow, as well as the complex coupling between these three processes. Stone (1992) used the mechanical creep closure code SANCHO to simulate the closure of a single, perfectly sealed disposal room filled with waste and backfill. The results of the SANCHO f-series simulations provide a relationship between gas generation, room closure, and room pressure. Several methods for coupling this relationship with multiphase fluid flow into and out of a room were examined by Freeze et al. TOUGH2 was employed to couple the processes of gas generation, room closure/consolidation, and multiphase brine and gas flow. Two empirically-based methods for approximating salt creep and room consolidation were implemented in TOUGH2: the pressure-time-porosity line interpolation approach and the fluid-phase-salt approach. Both approaches utilized links to the SANCHO f-series simulation results to calculate room-void-volume changes with time during a simulation.

15036 (SAND–95-0565C) **The effect of stratigraphic dip on multiphase flow at the Waste Isolation Pilot Plant.** Webb, S.W.; Larson, K.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–6: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009591. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a US Department of Energy research and development facility for the underground disposal of transuranic waste from US defense-related activities. The WIPP repository is located within the Salado Formation, which is comprised of beds of pure and impure halite with thin interbeds of anhydrite and related clay seams. This formation is brine saturated with a pore pressure of approximately 12.5 MPa at the repository horizon. The Salado Formation dips gently southeast, on the average approximately 1°, with steeper dips locally. Elevated repository pressures, caused by gas generated as emplaced waste corrodes and degrades, may drive brine and gas out of the repository into the surrounding formation. Stratigraphic dip may cause increased brine inflow to the repository through countercurrent flow in the interbeds and enhanced gas migration distances in the updip direction due to buoyancy. Two-dimensional simulations of isolated WIPP repository room have been performed using TOUGH2 for horizontal and 1° dipping stratigraphy. The impact of dip on multiphase flow at the WIPP may be significant. With dip, an additional mechanism for brine inflow may occur, namely the formation of a cell of countercurrent brine and gas flow in the interbeds. The additional volume of brine inflow resulting from the countercurrent flow cell may be of similar magnitude to brine inflow without dip. Therefore, dip must be included in any repository model to include the countercurrent brine inflow mechanism. Gas migration may also be significantly influenced due to dip. Gas migration distances may increase dramatically with preferential migration updip.

15037 (SAND–95-0568C) **Modification and application of TOUGH2 as a variable-density, saturated-flow code and comparison to SWIFT II results.** Christian-Frear, T.L.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–3: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009596. Source: OSTI; NTIS; INIS; GPO Dep.

Human intrusion scenarios at the Waste Isolation Pilot Plant (WIPP) involve penetration of the repository and an underlying brine reservoir by a future borehole. Brine and gas from the brine reservoir and the repository may flow up the borehole and into the overlying Culebra formation, which is saturated with water containing different amounts of dissolved 'solids resulting in a spatially varying density. Current modeling approaches involve perturbing a steady-state Culebra flow field by inflow of gas and/or brine from a breach borehole that has passed through the repository. Previous studies simulating steady-state flow in the Culebra have been done. One specific study by LaVenue et al. (1990) used the SWIFT 2 code, a single-phase flow and transport code, to develop the steady-state flow field. Because gas may also be present in the fluids from the intrusion borehole, a two-phase code such as TOUGH2 can be used to determine the effect that emitted fluids may have on the steady-state Culebra flow field. Thus a comparison between TOUGH2 and SWIFT2 was prompted. In order to compare the two codes and to evaluate the influence of gas on flow in the Culebra, modifications were made to TOUGH2. Modifications were performed by the authors to allow for element-specific values of permeability, porosity, and elevation. The analysis also used a new equation of state module for a water-brine-air mixture, EOS7 (Pruess, 1991), which was developed to simulate variable water densities by assuming a miscible mixture of water and brine phases and allows for element-specific brine concentration in the INCON file.

15038 (SAND–95-0587C) **Summary of applications of TOUGH2 to the evaluation of multiphase flow processes at the WIPP.** Webb, S.W. (Sandia National Labs., Albuquerque, NM (United States)); Larson, K.W.; Freeze, G.A.; Christian-Frear, T.L. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–4: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009593. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a US Department of Energy (DOE) research and development facility for the underground disposal of transuranic waste in southeastern New Mexico. The WIPP repository is located 655 m below the land surface in the lower portion of the Salado Formation, which is comprised of beds of pure and impure halite with thin interbeds of anhydrite and related clay seams. The regional dip of the Salado Formation is approximately 1° southeast in the vicinity of the repository. The proposed waste storage area has eight waste disposal panels, each of which will contain seven rooms. The repository is designed to follow a single stratigraphic horizon. Due to the dip, the north end of the repository will be about 10 meters higher than the south end. Waste that is emplaced in the disposal rooms will generate gas due to microbial degradation, anoxic corrosion, and radiolysis. Brine inflow to the rooms from the surrounding Salado Formation may significantly influence the gas generation rate and the total amount of gas generated. The salt surrounding the repository will

creep in response to the excavation, reducing the room volume. Gas generation in the room may increase the pressure sufficiently to drive brine and gas into the surrounding Salado Formation. Migration of gas and brine in the Salado is an important factor in evaluating the performance of the repository. The studies summarized in this paper have. been performed to evaluate brine and gas flow processes in the WIPP disposal system and to identify some of the important processes. These studies are done in support of, but are not part of, the formal Performance Assessment (PA) effort. Because of probabilistic and system-scale requirements, the PA effort uses the Sandia-developed BRAGFLO (BRine And Gas FLOw) code for multiphase flow calculations.

15039 (SKB-TR–94-16) **Kinetic and thermodynamic studies of uranium minerals. Assessment of the long-term evolution of spent nuclear fuel.** Casas, I. (MBT Tecnologia Ambiental, Cerdanyola (Spain)); Bruno, J.; Cera, E.; Finch, R.J.; Ewing, R.C. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Oct 1994. 80p. Order Number DE95627051. Source: OSTI; NTIS; INIS.

We have studied the dissolution behavior of uraninite, becquerelite, schoepite and uranophane. The information obtained under a variety of experimental conditions has been combined with extensive solid phase characterizations, performed in both leached and unleached samples. The overall objective is to construct a thermodynamic and kinetic model for the long-term oxidation alteration of UO_2(s), as an analogy of the spent nuclear fuel matrix. We have determined the solubility product for becquerelite ($logK_{s0}$ 32.7±1.3) and uranophane ($logK_{s0}$ = 7.8±0.8). In some experiments, the reaction progress has shown initial dissolution of uranophane followed by precipitation of a secondary solid phase, characterized as soddyite. The solubility production for this phase has been determined ($logK_{s0}$ = 3.0±2.9). We have studied the kinetics of dissolution of uraninite, uranophane and schoepite under oxidizing conditions in synthetic granitic groundwater. BET measurements have been performed for uraninite and uranophane. For schoepite, the measurement has not been performed due to lack of sufficient amount of sample. The normalized rates of dissolution of uraninite and uranophane have been calculated referred to the uranium release, as $1.97x10^{-8}$ moles h^{-1} m^{-2} and $4.0x\ 10^{-9}$ moles h^{-1} m^{-2}, respectively. For schoepite, the dissolution process has shown two different rates, with a relatively fast initial dissolution rate of $1.97x10^{-8}$ moles h^{-1} followed, after approximately 1000 hours, by a slower one of $1.4x10^{-9}$ moles h^{-1}. No formation of secondary phases has been observed in those experiments, although final uranium concentrations have in all cases exceeded the solubility of uranophane, the thermodynamically more stable phase under the experimental conditions. 24 refs, 45 figs.

15040 (SKB-TR–94-19) **Deep drilling KLX 02. Drilling and documentation of a 1700 m deep borehole at Laxemar, Sweden.** Andersson, O. (VBB VIAK AB, Malmoe (Sweden)). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Aug 1994. 65p. Order Number DE95628830. Source: OSTI; NTIS; INIS.

In this report the preparation and execution of the deep core drilling KLX 02 is described. The hole was drilled with the wireline methods, NQ dimension (diameter 76 mm), to a final depth of 1700.5 m. Prior to core drilling a diameter 215 mm pilot hole was pre drilled to 200 m with controlled hammer drilling (DTH). In this hole casing and air-lift equipment was installed with the aim to support the circulation of drilling fluid. During core drilling there was a measurement of major drilling parameters and drilling fluid in and out of hole. As a fluid tracer uranine was used. Each 300 m of core drilling air-lift pump tests were performed. After completion a flow-meter log was run to finalize the project phase. It can be concluded that both the pre drilling and core drilling methods used proved to be successful. No severe technical problem occurred. However, potential risks have been pointed at in the report. The air-lift system functioned only partly and has to be modified for further use. Also the technique for monitoring of drilling parameters needs improvement as does the method for air-lift pump tests with packer. The organisation model for planning and realization functioned satisfactory and can be recommended for similar future projects. 9 refs, numerous tabs and figs.

15041 (SKB-TR–94-26) **A surface chemical model of the bentonite-water interface and its implications for modelling the near field chemistry in a repository for spent fuel.** Wieland, E. (MBT Umwelttechnik AG, Zuerich, (Switzerland)); Wanner, H.; Albinsson, Y.; Wersin, P.; Karnland, O. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Jul 1994. 76p. Order Number DE95627052. Source: OSTI; NTIS; INIS.

Understanding the surface chemical properties of montmorillonite in near-neutral and alkaline media is essential for establishing a chemical model of the bentonite/water interaction applicable for repository conditions. A pretreated and well-characterised Wyoming MX-80 bentonite has been used for investigating the acid/base characteristics of Na-montmorillonite. The CEC of Na-montmorillonite was determined to 108 meq/100 g for pretreated bentonite and to 85 meq/100 g for the bulk material. The BET surface area was (31.53±0.16)m^2/g. Potentiometric titrations of montmorillonite suspensions at ionic strengths I=0.005 M, 0.05 M and 0.5 M were conducted as batch-type experiments. Deprotonation of surface OH groups possibly exposed at the edge surface causes an overall negative charge on the surface of montmorillonite in the alkaline pH range. In this pH range, the protolysis degree of OH groups increases with increasing pH and ionic strength. The proton density on the surface of montmorillonite increases with decreasing pH in the acidic pH range (pH<7.5). In this pH range, two simultaneously occurring surface reactions account for the observed proton density on montmorillonite: Protonation of edge OH groups and ion exchange of the major cations for H^+ at the structural-charge sites. The experimental results are interpreted in terms of a two-site model with structural-charge surface sites (X layer sites) and variable-charge surface sites (edge OH groups) as the reactive surface functionalities. The total population of the surface sites are estimated to TOT-OH=$2.84*10^{-5}$ mol/g, TOT-X=$2.22*10^{-5}$ mol/g. The intrinsic acidity constants for the OH groups are determined to pK^{int}_{a1}= (5.4±0.1) and pK^{int}_{a2}=(6-7±0.1), respectively, using th configuration of the diffuse double layer model (DDLM). 43 refs, 18 figs, 11 tabs.

15042 (SKB-TR–94-27) **Experimental study of strontium sorption on fissure filling material.** Eriksen, T.E. (Royal Institute of Technology, Stockholm (Sweden). Dept. of Chemistry); Cui, Daqing. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1994. 31p. Order Number DE95628831. Source: OSTI; NTIS; INIS.

We have carried out a comparative study of sorption and desorption of strontium in groundwater on separated magnetic and size fractions of fissure filling material taken from natural fissures in granitic rock. Complete reversibility of the sorption process was demonstrated by identical Freundlich isotherms, isotopic exchangeability and pH dependence of the distribution coefficients Rd. The sorption was found to be strongly pH dependent in the range 3-11. The pH effect can be accommodated in the sorption model by considering the surface areas and surface charges of the minerals in the fissure filling material. 20 refs, 9 figs, 3 tabs.

15043 (SKB-TR–94-29) **Heat conductivity of buffer materials.** Boergesson, L. (Clay Technology AB, Lund (Sweden)); Fredrikson, Anders; Johannesson, L.E. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Nov 1994. 63p. Order Number DE95628832. Source: OSTI; NTIS; INIS.

The report deals with the thermal conductivity of bentonite based buffer materials. An improved technique for measuring the thermal conductivity of buffer materials is described. Measurements of FLAC calculations applying this technique have led to a proposal of how standardized tests should be conducted and evaluated. The thermal conductivity of bentonite with different void ratio and degree of water saturation has been determined in the following different ways: * Theoretically according to three different investigations by other researchers. * Laboratory measurements with the proposed method. * Results from back-calculated field tests. Comparison and evaluation showed that these results agreed very well, when the buffer material was almost water saturated. However, the influence of the degree of saturation was not very well predicted with the theoretical methods. Furthermore, the field tests showed

that the average thermal conductivity in situ of buffer material (compacted to blocks) with low degree of water saturation was lower than expected from laboratory tests. 12 refs, 29 figs, 11 tabs.

15044 (SKB-TR–94-30) **Calibration with respect to hydraulic head measurements in stochastic simulation of groundwater flow - a numerical experiment using MATLAB.** Eriksson, L.O. (Starprog AB (Sweden)); Oppelstrup, J. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1994. 62p. Order Number DE95628833. Source: OSTI; NTIS; INIS.

A simulator for 2D stochastic continuum simulation and inverse modelling of groundwater flow has been developed. The simulator is well suited for method evaluation and what-if simulation and written in MATLAB. Conductivity fields are generated by unconditional simulation, conditional simulation on measured conductivities and calibration on both steady-state head measurements and transient head histories. The fields can also include fracture zones and zones with different mean conductivities. Statistics of conductivity fields and particle travel times are recorded in Monte-Carlo simulations. The calibration uses the pilot point technique, an inverse technique proposed by RamaRao and LaVenue. Several Kriging procedures are implemented, among others Kriging neighborhoods. In cases where the expectation of the log-conductivity in the truth field is known the nonbias conditions can be omitted, which will make the variance in the conditionally simulated conductivity fields smaller. A simulation experiment, resembling the initial stages of a site investigation and devised in collaboration with SKB, is performed and interpreted. The results obtained in the present study show less uncertainty than in our preceding study. This is mainly due to the modification of the Kriging procedure but also to the use of more data. Still the large uncertainty in cases of sparse data is apparent. The variogram represents essential characteristics of the conductivity field. Thus, even unconditional simulations take account of important information. Significant improvements in variance by further conditioning will be obtained only as the number of data becomes much larger. 16 refs, 26 figs.

15045 (SWE-SWB–95-0004) **Waste Minimization Measurement and Progress Reporting.** Stone, K.A. Westinghouse Savannah River Co., Aiken, SC (United States). 13 Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–118: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95060100. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Savannah River Company is implementing productivity improvement concepts into the Waste Minimization Program by focusing on the positive initiatives taken to reduce waste generation at the Savannah River Site. Previous performance measures, based only on waste generation rates, proved to be an ineffective metric for measuring performance and promoting continuous improvements within the Program. Impacts of mission changes and non-routine operations impeded development of baseline waste generation rates and often negated waste generation trending reports. A system was developed to quantify, document and track innovative activities that impact waste volume and radioactivity/toxicity reductions. This system coupled with Management-driven waste disposal avoidance goals is proving to be a powerful tool to promote waste minimization awareness and the implementation of waste reduction initiatives. Measurement of waste not generated, in addition to waste generated, increases the credibility of the Waste Minimization Program, improves sharing of success stories, and supports development of regulatory and management reports.

15046 (UCRL-ID–116187-94-11) **The Mixed Waste Management Facility monthly report for November 1994.** Lawrence Livermore National Lab., CA (United States). Dec 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (L–18869-1). Order Number DE95009883. Source: OSTI; NTIS; GPO Dep.

During November, technical progress continued in accordance with the FY95 Plan (the FY95 Plan document will be issued in early December). Engineering development and design activities continued in support of the preliminary design (PD) of MWMF major subsystems, although certain systems are now scheduled for a late-phased PD to accommodate DOE funding constraints. Management focus during November centered on completion of key documentation in support of the FY96 DWTF Validation and Baseline Change Proposal. This was of particular importance as a result of the DOE decision to co-locate DWTF (LLNL Hazardous Waste Management operations) and MWMF into a common complex and to merge specific functions. Documentation was completed on time and presented to the project validators on December 1, 1994. In addition, significant progress was made on the FY95 Plan and Revision 1.2 of the MWMF Project Baseline (to incorporate integration with DWTF) using the latest guidance from DOE for funding availability. The FY95 Plan has been essentially completed and is now scheduled to be issued in early December. Finally, an overview of the MWMF Project was presented at the Environmental Business Opportunities meeting at LLNL - a forum organized by LLNL to reach small and disadvantaged businesses.

15047 (UCRL-ID–119720) **Expedited demonstration of molten salt mixed waste treatment technology. Final report.** Lawrence Livermore National Lab., CA (United States). 2 Feb 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009473. Source: OSTI; NTIS; INIS; GPO Dep.

This final report discusses the molten salt mixed waste project in terms of the various subtasks established. Subtask 1: Carbon monoxide emissions; Establish a salt recycle schedule and/or a strategy for off-gas control for MWMF that keeps carbon monoxide emission below 100 ppm on an hourly averaged basis. Subtask 2: Salt melt viscosity; Experiments are conducted to determine salt viscosity as a function of ash composition, ash concentration, temperature, and time. Subtask 3: Determine that the amount of sodium carbonate entrained in the off-gas is minimal, and that any deposited salt can easily be removed form the piping using a soot blower or other means. Subtask 4: The provision of at least one final waste form that meets the waste acceptance criteria of a landfill that will take the waste. This report discusses the progress made in each of these areas.

15048 (UCRL-JC–118317) **Characterization of waste drums using nonintrusive active and passive computed tomography.** Roberson, G.P.; Martz, H.E.; Decman, D.J.; Camp, D.C.; Azevedo, S.G.; Keto, E.R. Lawrence Livermore National Lab., CA (United States). Aug 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940216–8: Nondestructive assay and nondestructive examination waste chracterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE95008830. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a data acquisition scanner for gamma-ray nondestructive assay (NDA) active and passive computed tomography (A&PCT) along with associated computational techniques for image reconstruction, analysis, and display. We are using this scanner to acquire data sets of mock-waste drums at Lawrence Livermore National Laboratory (LLNIL). In this paper, we discuss some issues associated with gamma-ray spectroscopy assay, NDA imaging, describe the design and construction of an NDA drum scanner and report on code development for image reconstruction. We also present representative A&PCT assay results of well characterized mock-waste drums. These preliminary results suggest that A&PCT imaging can be used to produce accurate absolute assays of radioactivity in real-waste drums.

15049 (UCRL-JC–118741-Rev.1) **Utilization of Cs^{137} to generate a radiation barrier for weapons grade plutonium immobilized in borosilicate glass canisters. Revision 1.** Jardine, L.J.; Armantrout, G.A.; Collins, L.F. Lawrence Livermore National Lab., CA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950216–111-Rev.1: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009844. Source: OSTI; NTIS; INIS; GPO Dep.

One of the ways recommended by a recent National Academy of Sciences study to dispose of excess weapons-grade plutonium is to encapsulate the plutonium in a glass in combination with high-level radioactive wastes (HLW) to generate an intense radiation dose rate field. The objective is to render the plutonium as difficult to access as the plutonium contained in existing US commercial spent light-water reactor (LWR) fuel until it can be disposed of in a

permanent geological repository. A radiation dose rate from a sealed canister of 1,000 rem/h (10 Sv/h) at 1 meter for at least 30 years after fabrication was assumed in this paper to be a radiation dose comparable to spent LWR fuel. This can be achieved by encapsulating the plutonium in a borosilicate glass with an adequate amount of a single fission product in the HLWS, namely radioactive Cs^{137}. One hundred thousand curies of Cs^{137} will generate a dose rate of 1,000 rem/h (10 Sv/h) at 1 meter for at least 30 years when imbedded into canisters of the size proposed for the Savannah River Site's vitrified high-level wastes. The United States has a current inventory of 54 MCi of CS^{137} that has been separated from defense HLWs and is in sealed capsules. This single curie inventory is sufficient to spike 50 metric tons of excess weapons-grade plutonium if plutonium can be loaded at 5.5 wt% in glass, or 540 canisters. Additional CS^{137} inventories exist in the United States' HLWs from past reprocessing operations, should additional curies be required. Using only one fission product, CS^{137}, rather than the multiple chemical elements and compounds in HLWs to generate a high radiation dose rate from a glass canister greatly simplifies the processing engineering retirement for encapsulating plutonium in a borosilicate glass.

15050 (UCRL-JC–118901) **Stabilization of inorganic mixed waste to pass the TCLP and STLC tests using clay and pH-insensitive additives.** Bowers, J.S. (Lawrence Livermore National Lab., CA (United States). Hazardous Waste Management Div.); Anson, J.R.; Painter, S.M.; Maitino, R.E. Lawrence Livermore National Lab., CA (United States). Mar 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9504134–2: HAZMACON '95: hazardous materials management conference and exhibition, San Jose, CA (United States), 4-6 Apr 1995). Order Number DE95009534. Source: OSTI; NTIS; INIS; GPO Dep.

Stabilization traps toxic contaminants (usually both chemically and physically) in a matrix so that they do not leach into the environment. Typical contaminants are metals (mostly transition metals) that exhibit the characteristic of toxicity. The stabilization process routinely uses pozzolanic materials. Portland cement, fly ash-lime mixes, gypsum cements, and clays are some of the most common materials. In many instances, materials that can pass the Toxicity Characteristic Leaching Procedure (TCLP-the federal leach test) or the Soluble Threshold Leachate Concentration (STLC-the California leach test) must have high concentrations of lime or other caustic material because of the low pH of the leaching media. Both leaching media, California's and EPA's, have a pH of 5.0. California uses citric acid and sodium citrate while EPA uses acetic acid and sodium acetate. These media can form ligands that provide excellent metal leaching. Because of the aggressive nature of the leaching medium, stabilized wastes in many cases will not pass the leaching tests. At the Lawrence Livermore National Laboratory, additives such as dithiocarbamates and thiocarbonates, which are pH-insensitive and provide resistance to ligand formation, are used in the waste stabilization process. Attapulgite, montmorillonite, and sepiolite clays are used because they are forgiving (recipe can be adjusted before the matrix hardens). The most frequently used stabilization process consists of a customized recipe involving waste sludge, clay and dithiocarbamate salt, mixed with a double planetary mixer into a pasty consistency. TCLP and STLC data on this waste matrix have shown that the process matrix meets land disposal requirements.

15051 (UCRL-JC–118902) **Treatment of mixed waste coolant.** Kidd, S. (Lawrence Livermore National Lab., CA (United States). Hazardous Waste Management Div.); Bowers, J.S. Lawrence Livermore National Lab., CA (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9504134–1: HAZMACON '95: hazardous materials management conference and exhibition, San Jose, CA (United States), 4-6 Apr 1995). Order Number DE95009535. Source: OSTI; NTIS; INIS; GPO Dep.

The primary processes used at Lawrence Livermore National Laboratory (LLNL) for treatment of radioactively contaminated machine coolants are industrial waste treatment and in situ carbon adsorption. These two processes simplify approaches to meeting the sanitary sewer discharge limits and subsequent Land Disposal Restriction criteria for hazardous and mixed wastes (40 CFR 268). Several relatively simple technologies are used in industrial water treatment. These technologies are considered Best Demonstrated Available Technologies, or BDAT, by the Environmental Protection Agency. The machine coolants are primarily aqueous and contain water soluble oil consisting of ethanol amine emulsifiers derived from fatty acids, both synthetic and natural. This emulsion carries away metal turnings from a part being machined on a lathe or other machining tool. When the coolant becomes spent, it contains chlorosolvents carried over from other cutting operations as well as a fair amount of tramp oil from machine bearings. This results in a multiphasic aqueous waste that requires treatment of metal and organic contaminants. During treatment, any dissolved metals are oxidized with hydrogen peroxide. Once oxidized, these metals are flocculated with ferric sulfate and precipitated with sodium hydroxide, and then the precipitate is filtered through diatomaceous earth. The emulsion is broken up by acidifying the coolant. Solvents and oils are adsorbed using powdered carbon. This carbon is easily separated from the remaining coolant by vacuum filtration.

15052 (WHC-MR–0484) **Hazardous material reduction initiative.** Nichols, D.H. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008790. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Material Reduction Initiative (HMRI) explores using the review of purchase requisitions to reduce both the use of hazardous materials and the generation of regulated and nonregulated wastes. Based on an 11-month program implemented at the Hanford Site, hazardous material use and waste generation was effectively reduced by using a centralized procurement control program known as HMRI. As expected, several changes to the original proposal were needed during the development/testing phase of the program to accommodate changing and actual conditions found at the Hanford Site. The current method requires a central receiving point within the Procurement Organization to review all purchase requisitions for potentially Occupational Safety and Health Administration (OSHA) hazardous products. Those requisitions (approximately 4% to 6% of the total) are then forwarded to Pollution Prevention personnel for evaluation under HMRI. The first step is to determine if the requested item can be filled by existing or surplus material. The requisitions that cannot filled by existing or surplus material are then sorted into two groups based on applicability to the HMRI project. For example, laboratory requests for analytical reagents or standards are excluded and the purchase requisitions are returned to Procurement for normal processing because, although regulated, there is little opportunity for source reduction due to the strict protocols followed. Each item is then checked to determine if it is regulated or not. Regulated items are prioritized based on hazardous contents, quantity requested, and end use. Copies of these requisitions are made and the originals are returned to Procurement within 1-hr. Since changes to the requisition can be made at later stages during procurement, the HMRI fulfills one of its original premises in that it does not slow the procurement process.

15053 (WHC-SA–2675) **LLW solidification in cement: Effect of dilution.** Kruger, A.A. (Westinghouse Hanford Co., Richland, WA (United States)); Katz, A.; Brough, A.R.; Bakharev, T.; Kirkpatrick, R.J.; Struble, L.J.; Young, J.F. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Grant MJGSVV-097600. (CONF-941144–120: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95010108. Source: OSTI; NTIS; INIS; GPO Dep.

A simulated Low Level nuclear Waste (LLW) solution was tested for long term solidification in a cement-based matrix. The waste is characterized by high pH and high concentrations of sodium, aluminum, nitrate, nitrite, phosphate and carbonate. The effect of diluting the waste with additional water was studied. The cementitious matrix was composed of cement, fly-ash and clay (21%, 68% and 11% respectively) with high solution to solid ratio (1 liter /1 kg.). Mixes were prepared at 45°C and cured at 90°C for 28 days. Maximum 28 day compressive strengths and early age heat evolution were achieved by diluting the LLW solution to approximately

67% of its original concentration. More dilution led to a lower heat evolution and compressive strength. No dilution was found to give lower compressive strength, and a heat evolution that was delayed, and lower in intensity. XRD spectra showed formation of zeolites and tobermorite at the higher concentrations (67, 85, and 100% of the concentration of the undiluted simulated LLW), with a change from Na-Pl zeolite for 67% of the undiluted concentration to a sodalite at 100%. SEM observations showed a porous system for the low and high dilution rates but a less porous one for an intermediate level of dilution.

15054 (WHC-SA–2676) **Microstructural aspects of zeolite formation in alkali activated cements containing high levels of fly ash.** Kruger, A.A. (Westinghouse Hanford Co., Richland, WA (United States)); Brough, A.R.; Katz, A.; Bakharev, T.; Sun, G.K.; Kirkpatrick, R.J.; Struble, L.J.; Young, J.F. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941144–122: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95010107. Source: OSTI; NTIS; INIS; GPO Dep.

Wasteforms made by reaction at elevated temperature of a highly e simulated low level nuclear waste solution, having high sodium ion concentration, with a cementitious blend high in fly ash have been studied. Significant formation of Na-P1 zeolite (gismondine framework) and of a sodalite occurred. The time evolution of the crystalline phases over the first 28 days is reported for both adiabatic and isothermal curing, and the role of these phases in microstructure development is discussed. The level of carbonate ions in solution was found to have a substantial effect on strength evolution and chemistry.

15055 (WHC-SA–2729) **Long term decontamination at the Hanford Site: A case study.** Geuther, W.J. (Westinghouse Hanford Co., Richland, WA (United States)); Hansen, G.E. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941102–44: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95007795. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an engineering study that evaluates decontamination requirements at Hanford and the potential reutilization of the first plutonium processing production facility as a decontamination facility. The logic used to develop the study, the options available for a long-term decontamination mission, and the resultant strategy recommended in the study are presented. The paper provides a starting point for other similar study efforts. The process flowsheets, regulatory restrictions, and preconceptual designs developed in this study are common throughout the nuclear waste industry.

15056 (WHC-SD-CP-TP–083) **Test plan for non-radioactive testing of vertical calciner for development of direct denitration conversion of Pu-bearing liquors to stable, storage solids.** Fisher, F.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010091. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium-bearing liquors, including ANL scrap liquors, will be used for development and demonstration of a vertical calciner direct denitration process for conversion of those liquors to stable, storable PuO_2-rich solids. This test plan is to test with non-radioactive stand-in materials to demonstrate adequate performance of the vertical calciner and ancillary equipment.

15057 (WHC-SD-EN-AP–184) **Hanford Wells Integrity Inspection Plan for the ROM Program.** Dorsey, M.C. Westinghouse Hanford Co., Richland, WA (United States). 4 Apr 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010089. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document specifies the technical requirements, schedule, and process for conducting well integrity inspections and rehabilitation on resource protection wells under the custodianship of the RCRA and Operational Monitoring program.

15058 (WHC-SD-EN-EE–014) **Hanford site comprehensive site compliance evaluation report.** Burris, S.A.; Menard, N.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010074. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the first annual submittal by Westinghouse Hanford Company (WHC) and contains the results of inspections of the storm water outfalls listed in the Hanford Site Storm Water Pollution Prevention Plan (SWPPP) (WHC 1993a) as required by General Permit No. WA-R-00-OOOF (WA-R-00-Al7F). This report also describes the methods used to conduct the Comprehensive Site Compliance Evaluation (CSCE), as required in Part IV, Section D. 4. c of the General Permit, summarizes the results of the compliance evaluation, and documents significant leaks and spills.

15059 (WHC-SD-EN-QAPP–003-Rev.2) **Waste handling Quality Assurance Program Plan for Engineered Process Applications. Revision 2.** Biyani, R.K. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010147. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes methods which Engineered Process Applications personnel use to ensure that waste managed by them is in accordance with WHC-EP-0063, Hanford Site Solid Waste Acceptance Criteria. Hazardous waste, low-level waste, and mixed waste are covered.

15060 (WHC-SD-ER3297-TS–001-Rev.2) **Test specification for decant pump and winch assembly. Revision 2.** Staehr, T.W. Westinghouse Hanford Co., Richland, WA (United States). 22 Feb 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008433. Source: OSTI; NTIS; INIS; GPO Dep.

This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction with load sensing winch control, instrumentation and the associated PLC/PC control system. All assembly necessary for testing including piping, temporary wiring, etc., shall be performed by the Seller. All referenced figures are at the back of this document. The testing consists of performance testing, winch testing and calibration, instrumentation verification testing and run-in testing of the pump. Testing shall be done in the presence and under the direction of the Buyer in accordance with this procedure.

15061 (WHC-SD-ETF-PCP–001) **Control system troubleshooting guide for the 300 area treated effluent disposal facility.** McCarthy, R.J.; Whitehurst, R.; Knox, J.M.; Hultgrenn, H.M.; Bleazard, K. Westinghouse Hanford Co., Richland, WA (United States). 8 Aug 1994. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010061. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting Document is intended to be used to help locate problems with the 300 Area Treated Effluent Disposal Facility (TEDF) computer Control System.

15062 (WHC-SD-GN-TRP–30021) **Load test of the 306E Building roof deck and support structure.** McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Jan 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009152. Source: OSTI; NTIS; GPO Dep.

This reports the results of the load test of the 306E Building roof deck and support structures.

15063 (WHC-SD-LEF-CSCM–001) **Computer software configuration management plan for 200 East/West Liquid Effluent Facilities.** Graf, F.A. Jr. Westinghouse Hanford Co., Richland, WA (United States). 27 Feb 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008500. Source: OSTI; NTIS; INIS; GPO Dep.

This computer software management configuration plan covers the control of the software for the monitor and control system that

operates the Effluent Treatment Facility and its associated truck load in station and some key aspects of the Liquid Effluent Retention Facility that stores condensate to be processed. Also controlled is the Treated Effluent Disposal System's pumping stations and monitors waste generator flows in this system as well as the Phase Two Effluent Collection System.

15064 (WHC-SD-LEF-OTR–001) **200 Area treated effluent disposal facility operational test report.** Crane, A.F. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 184p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008801. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports the results of the 200 Area Treated Effluent Disposal Facility (200 Area TEDF) operational testing activities. These completed operational testing activities demonstrated the functional, operational and design requirements of the 200 Area TEDF have been met.

15065 (WHC-SD-LEF-QAPP–002) **200 Area Treated Effluent Disposal Facility Quality Assurance Project Plan.** Jungfleisch, F.M. Westinghouse Hanford Co., Richland, WA (United States). 24 Mar 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010149. Source: OSTI; NTIS; INIS; GPO Dep.

The project plan provides for the quality assurance of the 200 Area Treated Effluent Disposal Facility consistent with the Washington State Department of Ecology discharge monitoring permit. DQOs (data quality objective) support permit standards for data quality and quantity. Reference is made to groundwater monitoring, laboratory analyses, and data validation that are performed under related quality programs.

15066 (WHC-SD-LEF-TS–001-Rev.2) **200 Area Treated Effluent Disposal Facility operational test specification. Revision 2.** Crane, A.F. Westinghouse Hanford Co., Richland, WA (United States). 9 Feb 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007794. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the test specification and test requirements for the 200 Area Treated Effluent Disposal Facility (200 Area TEDF) operational testing activities. These operational testing activities, when completed, demonstrate the functional, operational and design requirements of the 200 Area TEDF have been met. The technical requirements for operational testing of the 200 Area TEDF are defined by the test requirements presented in Appendix A. These test requirements demonstrate the following: pump station No.1 and associated support equipment operate both automatically and manually; pump station No. 2 and associated support equipment operate both automatically and manually; water is transported through the collection and transfer lines to the disposal ponds with no detectable leakage; the disposal ponds accept flow from the transfer lines with all support equipment operating as designed; and the control systems operate and status the 200 Area TEDF including monitoring of appropriate generator discharge parameters.

15067 (WHC-SD-SNF-DRP–001) **Design Reconstitution Program Plan and procedures for K Basins.** Laney, T. Westinghouse Hanford Co., Richland, WA (United States). 12 Jan 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008035. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes a systematic program to establish, organize, and document the design basis and design requirement information for the K Basins where existing design information is inadequate. The Design Reconstitution Program involves identifying and retrieving design information from identified source documents; evaluating, verifying, and validating the design information; resolving discrepancies; regenerating missing critical design information; and preparing and issuing a summary document of the design information. Upon completion, the design requirements shall be evaluated with the facility as-found configuration to verify the adequacy of appropriate design requirements with the as-found configuration and to document and resolve any discovered discrepancies. Once the design requirement (design analysis, calculation, design basis) comparison is made and discrepancies resolved (dispositioned, implemented, and incorporated as required), the as-found condition of a drawing then becomes an as-built drawing that is released into the engineering release system. This as-built drawing is then the accurate accounting of the field configuration that is consistent with the design requirements (recovered through the design reconstitution program) and is used with high confidence to make valid engineering, operational, and maintenance decisions.

15068 (WHC-SD-SNF-SD–002) **Spent Nuclear Fuel Project technical baseline document. Volumes 1–4, FY 1994.** Womack, J.C. Westinghouse Hanford Co., Richland, WA (United States). 3 Apr 1995. 864p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010097. Source: OSTI; NTIS; INIS; GPO Dep.

The Technical Baseline document presents the results of the SNFP systems engineering analyses to date. These analyses establish the baseline functions, requirements, and interfaces to a level necessary to complete the SNFP mission as defined in the SNFP Mission Analysis Report (Volume II). It is a summary-level description of the activities necessary to successfully complete the SNFP mission. The time relationship of these activities is depicted in a two page Activities Logic Diagram (Figure 1.0-1). This document lacks detail in some areas because a clear programmatic and technical path forward is currently under development, and several key trade studies are yet to be completed. A narrative baseline description has been provided as a basis for a point of departure for individual trade studies and further ANFP definition and development. This document is composed of four volumes. Volume I presents the SNFP baseline description. Volume II presents an updated version of the Mission Analysis Report. Volume III presents the results of the functions and requirements analyses, which is an update of the draft of the SNFP Functions and Requirements Document. The initial alternatives analyses are also included in this volume. Volume IV presents the supporting data for the first three volumes.

15069 (WHC-SD-SNF-TP–009-Rev.1) **105-KE/KW isolation barrier leak test specification/test plan. Revision 1.** McCracken, K.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010056. Source: OSTI; NTIS; GPO Dep.

This supporting document uses an ECN to remove and replace pages in the 105-KE/KW test spec/test plan to clarify portions and correct administrative errors noted during recent reviews. No changes invalidate any safety or theory concerns.

15070 (WHC-SD-SNF-TP–011) **K-Basins debris removal equipment - test plan.** Pitkoff, C.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008471. Source: OSTI; NTIS; INIS; GPO Dep.

An undetermined amount of debris remains in the K-Basins which must be removed. Due to the different types of debris that will be removed, a variety of tools will be required to complete this project. This test plan gives s broad scope of the requirements that will be used for testing equipment for K-Basin debris removal. The equipment tested will be used in a radioactive environment. The equipment tested will be used to retrieve, cut, clean, and package debris from both K West and K East Basins. Testing is typically divided into six primary categories: development testing, acceptance testing, qualification testing, pre-operational testing, operational testing, and production/process testing.

15071 (WHC-SD-SNF-TP–013) **Test plan for K Basin Sludge Canister and Floor Sampling Device.** Meling, T.A. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010145. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the test plan and procedure forms for conducting the functional and operational acceptance testing of the K Basin Sludge Canister and Floor Sampling Device(s). These samplers samples sludge off the floor of the 100K Basins and out of 100K fuel storage canisters.

15072 (WHC-SD-TP-SEP–029) **Safety evaluation for packaging transfer of 101-AZ thermocouples.** Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 3 Mar 1995. 345p. DOE Contract AC06-87RL10930. Order Number DE95010075. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Evaluation for Packaging (SEP) provides evaluations and analysis considered necessary to approve a short-term onsite transfer campaign of seven thermocouples for the AZ tank to the Central Waste Complex (CWC). The SEP demonstrates that the transfer will provide an equivalent degree of safety as would be provided by the transfer of similar packages meeting the U.S. Department of Energy (DOE)/U.S. Nuclear Regulatory Commission (NRC) requirements. This fulfills onsite transportation requirements implemented by WHC-CM-2-14, Hazardous Material Packaging and Shipping.

15073 (WHC-SD-W026-PLN–006) **WRAP Module 1 sampling and analysis plan.** Mayancsik, B.A. Westinghouse Hanford Co., Richland, WA (United States). 24 Mar 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010148. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the methodology to sample, screen, and analyze waste generated, processed, or otherwise the responsibility of the Waste Receiving and Processing Module 1 facility. This includes Low-Level Waste, Transuranic Waste, Mixed Waste, and Dangerous Waste.

15074 (WHC-SD-W026-QAPP–001-Rev.1) **Quality Assurance Project Plan, W-026. Revision 1.** McGee, J.R. Westinghouse Hanford Co., Richland, WA (United States). 4 Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010105. Source: OSTI; NTIS; INIS; GPO Dep.

This project will provide a facility in which retrieved and newly generated 55-gallon drums and 83-gallon overpacked drums of contact handled solid radioactive waste are inspected, assayed, and drums opened if necessary. Waste contents will be sorted and segregated if necessary, empty drums and waste compacted, repackaged, certified, and shipped to final disposal. Small newly generated boxes will be similarly treated. (Boxes will not be opened in WRAP Module 1, but in a later WRAP Module.) This document describes the Quality Assurance Program to be followed during the definitive design phase and various stages of construction.

15075 (WHC-SD-W100-TD–001) **183-H Basin Mixed Waste Analysis and Testing Report.** Westinghouse Hanford Co., Richland, WA (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010088. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this sampling and analysis report is to provide data necessary to support treatment and disposal options for the low-level mixed waste from the 183-H solar evaporation ponds. In 1973, four of the 16 flocculation and sedimentation basins were designated for use as solar evaporation basins to provide waste reduction by natural evaporation of liquid chemical wastes from the 300 Area fuel fabrication facilities. The primary purpose of this effort is to gather chemical and bulk property data for the waste in the drums/boxes of sediment removed from the basin at Central Waste Complex.

15076 (WHC-SD-W112-CSER–001) **Criticality classification of enhanced radioactive and mixed waste storage.** Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010103. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to evaluate the criticality potential of the Enhanced Radioactive and Mixed Waste Storage Facility, Project W-112, and to demonstrate that the facility can be classified as a limited control facility in accordance with the requirements of the Nuclear Criticality Safety Manual, WHC-CM-42-9 (WHC 1994). This document also recommends reducing the extent of criticality safety training that operators in W-112 should receive and minimize the level of criticality safety design reviews and inspections commensurate with the type of activities engaged in the facility.

15077 (WHC-SD-W151-ATP–002) **Cathodic protection acceptance test procedure.** Nordquist, E.M. Westinghouse Hanford Co., Richland, WA (United States). 2 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010226. Source: OSTI; NTIS; INIS; GPO Dep.

This acceptance test procedure is to document testing of added anodes to existing Rectifier No. 11. Anodes were added under Project W-151, Tank 101-AZ Waste Retrieval System.

15078 (WHC-SD-W236A-PLN–006-Rev.2) **Plant Acquisition Plan: Multi-function Waste Tank Facility. Revision 2.** McCallum, J.R. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 15 Mar 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009092. Source: OSTI; NTIS; INIS; GPO Dep.

Provides a basis for configuring design packages for construction and procurement activities.

15079 (WHC-SD-W236A-SDRD–001-Rev.1) **Supplemental design requirements document, Multifunction Waste Tank Facility, Project W-236A. Revision 1.** Groth, B.D. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1995. 196p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005466. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility (MWTF) consists of four, nominal 1 million gallon, underground double-shell tanks, located in the 200-East area, and two tanks of the same capacity in the 200-West area. MWTF will provide environmentally safe storage capacity for wastes generated during remediation/retrieval activities of existing waste storage tanks. This document delineates in detail the information to be used for effective implementation of the Functional Design Criteria requirements.

15080 (WHC-SD-W236A-TR–001-Rev.1) **Multi-function Waste Tank Facility Qualification and Training Plan, Project W-236A.** Smith, L.K. Westinghouse Hanford Co., Richland, WA (United States). 1 Dec 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010228. Source: OSTI; NTIS; INIS; GPO Dep.

The MWTF Qualification and Training Plan is being issued as a supporting document for Project W-236A. This plan sets forth the qualification and training requirements for personnel assigned to positions which have a functional impact on the Multi-Functional Waste Tank Facility (MWTF), Project W-236A. Guidance for employee training is provided in the Employee Training Policy, Rev. 0, dated August 12, 1994 and the Training Administration Manual, WHC-CM-2-15. This document contains training plans for Westinghouse Hanford Company (WHC) and ICF Kaiser Hanford Company (ICF KH). Management shall review/update the specific contents semi-annually.

15081 (WHC-SD-W320-CBA–001) **W-320 pit liner vs. coating cost risk benefit analysis.** Symons, G.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Dec 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010077. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the costs and the risk trade-offs associated with the two pit lining or confinement options being considered as part of the Tank 241-C-106 Waste Retrieval Project. Both of these pit secondary confinement options (i.e., stainless steel pit liners and epoxy coating) can be implemented in a fashion that complies with criteria for secondary containment systems specified by the Washington Administration Codes (WAC-173-303-604). Direct life cycle costs of the two options including design, fabrication, installation, radiation, exposure, and decontamination and disposal costs are compared. Risk is expressed as probability weighted with the confinement consequences that could be mitigated by the pit liner. The risk impact of the choice of the confinement option is also evaluated in the context of the overall risk associated with the sluicing project and continued storage of the high-heat waste in the Tank 241-C-106 pending completion of the W-320 Project. The two

pit secondary containment options are stainless steel line and epoxy coating.

15082 (WHC-SD-W340-ECOR–001) **Project W-340 tank 241-C-106 manipulator system closeout summary.** McDaniel, L.B. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 476p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010079. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the work that was ongoing when Project W-340 was put on hold. Project W-340: Tank 241-C-106 Manipulator Retrieval System, was a candidate FY98 Major System Acquisition. The project was to develop, procure and deploy a Long Reach Manipulator (LRM) waste retrieval system to provide an alternate method to completing the in-tank demonstration of Single Shell Tank waste retrieval technology. The need for enhanced capabilities derives from (1) the inability of the baseline technology to retrieve certain hard waste forms; (2) uncertainty in the quantity of leakage which will be allowed. Numerous studies over the years have identified an arm architecture as a promising retrieval technology to overcome these concerns. The W340 project was intended to further develop and demonstrate this alternative, as part of selecting the best approach for all tanks. Prior to completing the effort, it was determined that an LRM system was too architecture specific and was envisioned to be too expensive for a one time demonstration of retrieval technology. At the time the work was stopped, an effort was underway to broaden the project scope to allow alternatives to an arm-based system.

15083 (WHC-SD-WM-ANAL–029) **Stress analysis of portable safety platform (Core Sampler Truck).** Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010136. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the stress analysis and evaluation of the portable platform of the rotary mode core sampler truck No. 2 (RMCST #2). The platform comprises railing, posts, deck, legs, and a portable ladder; it is restrained from lateral motion by means of two brackets added to the drill-head service platform.

15084 (WHC-SD-WM-AP–035) **Technical task plan for Acquire Commercial Technology for Retrieval.** McDaniel, L.B. Westinghouse Hanford Co., Richland, WA (United States). 7 Apr 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010192. Source: OSTI; NTIS; INIS; GPO Dep.

Objective is to determine from industry their best approaches to retrieving waste from the Single Shell Tanks. This task plan describes the first 18 months of work; the task will be further defined as the work progresses. The retrieval is to be demonstrated on tank 241-C-106.

15085 (WHC-SD-WM-ATP–063-Rev.1) **Acceptance test procedures for rotary mode core sampling exhausters.** Robinson, J.D. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010139. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this ATP is to provide systematic acceptance testing of two rotary mode core sampling exhausters. These exhausters will support core sampling systems three and four. The exhaust gases are monitored for radionuclides, ammonia, and total organics.

15086 (WHC-SD-WM-ATP–106) **Acceptance test procedure for the 241-SY-101 flexible receiver gamma detector system.** Aftanas, B.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005098. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure is for the 241-SY-101 Flexible Receiver Gamma Detector System.

15087 (WHC-SD-WM-ATP–124) **Nitrogen chiller acceptance test procedure.** Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008881. Source: OSTI; NTIS; INIS; GPO Dep.

This document includes the inspection and testing requirements for the Nitrogen Chiller unit. The Chiller will support the Rotary Mode core Sampling System during the summer. The Chiller cools the Nitrogen Purge Gas that is used when drilling in tank wastes to cool the drill bit.

15088 (WHC-SD-WM-ATP–127) **Acceptance test procedure for the ultra high pressure bore head for use in the self-installing liquid observation well.** Hertelendy, N.A. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010140. Source: OSTI; NTIS; INIS; GPO Dep.

In order to monitor waste stored in single-shell tanks, liquid observation wells (LOWs) are installed to permit periodic insertion of instrumentation probes to evaluate the waste cross sections. An ultra high pressure water bore head, developed for installing instrument trees, was adapted for use with the LOWs. The modification facilitates the removal of the high pressure water feed system after installation. This document describes a series of tests that ensures that the design meets all the functional requirements.

15089 (WHC-SD-WM-ATR–094) **Acceptance Test Report for 241-SY Pump Cradle Hydraulic System.** Koons, B.M. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009095. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this ATP is to verify that hydraulic system/cylinder procured to replace the cable/winch system on the 101-SY Mitigation Pump cradle assembly fulfills its functional requirements for raising and lowering the cradle assembly between 70 and 90 degrees, both with and without pump. A system design review was performed on the 101-SY Cradle Hydraulic System by the vendor before shipping (See WHC-SD-WM-DRR-045, 241-SY-101 Cradle Hydraulic System Design Review). The scope of this plan focuses on verification of the systems ability to rotate the cradle assembly and any load through the required range of motion.

15090 (WHC-SD-WM-CGA–001) **Video Graphic Recorder (VGR) calibration.** Akers, J.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010137. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines a calibration procedure for the Video Graphic Recorder (VGR) on the Rotary Mode Core Sample Trucks (RMCST) three and four. Intent is to use this document to check/calibrate the VGR until a calibration procedure can be created by Tank Waste Remediation System personnel.

15091 (WHC-SD-WM-CMD–002) **Closed out tank 241-SY-101 DACS system change requests No. 101-200.** Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008838. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a record closed out System Change Request No. 101-200 used during the development of the 241-SY-101 Hydrogen Mitigation Project Data Acquisition Control System.

15092 (WHC-SD-WM-CMD–003) **Closed out tank 241-SY-101 DACS system change requests No. 201-300.** Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 228p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008834. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a record of closed out System Change Requests No. 201-300 used during the development of the 241-SY-101 Hydrogen Mitigation Project Data Acquisition Control System.

15093 (WHC-SD-WM-DA–183) **Compressed air piping, 241-SY-101 hydraulic pump retrieval trailer.** Wilson, T.R. Westinghouse Hanford Co., Richland, WA (United States). 12 Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-87RL10930. Order Number DE95005097. Source: OSTI; NTIS; INIS; GPO Dep.

The following Design Analysis was prepared by the Westinghouse Hanford Company to determine pressure losses in the compressed air piping installed on the hydraulic trailer for the 241-SY-101 pump retrieval mission.

15094 (WHC-SD-WM-DP–079) **216-Day report for Tank 241-C-111, cores 58 and 59.** Rice, A.D. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005412. Source: OSTI; NTIS; INIS; GPO Dep.

Three core samples from tank C-111, and a field blank, were received by the 222-S laboratories. Cores 58, 59, and the field blank were analyzed in accordance with plans. A hot cell blank was analyzed at the direction of the hot cell chemist. No sample results exceeded the notification limits. Core 60 was not analyzed.

15095 (WHC-SD-WM-DP–098) **45-Day safety screening report for grab samples from Tank 241-AP-107.** Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009147. Source: OSTI; NTIS; INIS; GPO Dep.

Three samples; 107-AP-1C, 107-AP-2c and 107-AP-3C; were received at 222-S Laboratory for analysis of DSC, TGA and visual appearance. Four additional samples; 107-AP-1D, 107-AP-2D, 107-AP-3D and 107-AP-6; were received for visual appearance only. No results exceeded the safety screen notification criteria. This report compiles the analytical results. Tank 241-AP-107 is a double-shell tank which is not on any of the four Watch Lists.

15096 (WHC-SD-WM-DP–099) **45-Day safety screen results for Tank 241-C-103, Cores 63 and 66.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010043. Source: OSTI; NTIS; INIS; GPO Dep.

Two core samples from tank C-103, obtained by the push-mode core sampling method, were received, extruded, and analyzed by the 222-S Laboratories in accordance with References 2 (core 63) or 3 (core 66). Drainable liquids were analyzed at the segment level for a separable organic layer, energetics by DSC, and percent water by TGA. Sludge samples were analyzed at the half-segment level by DSC, TGA, and for total alpha. Notification limits were exceeded for the following: (1) presence of a separable organic layer in the drainable liquid of segment 1, cores 63 and 64, and segment 2 of core 63; (2) DSC exotherm greater than 481 J/g on the lower half of segment 3 and drainable liquid of segment 4 of core 63; and (3) percent water less than 17% on the upper half of segment 4 of core 63.

15097 (WHC-SD-WM-DP–101) **45-Day Safety Screen results for Tank 241-TY-104, Auger Samples, 95-AUG-008 and 95-AUG-009.** Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010193. Source: OSTI; NTIS; INIS; GPO Dep.

The two auger samples were collected from single-shell tank 241-TY-104 on February 28, 1995, and were analyzed by the 222-S Laboratory in accordance with the tank characterization plan. The results for those primary analytes (differential scanning calorimetry, thermogravimetry, total alpha radioactivity, and total organic carbon) indicate that no safety screening notification limits were exceeded.

15098 (WHC-SD-WM-EE–004-Rev.1) **Performance assessment of grouted double-shell tank waste disposal at Hanford. Revision 1.** Shade, J.W., Kincaid, C.T. (Pacific Northwest Lab., Richland, WA (United States)); Whyatt, G.A.; Rhoads, K.; Westsik, J.H. Jr.; Freshley, M.D.; Blanchard, K.A.; Shade, J.W.; Piepho, M.G.; Voogd, J.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 1,201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008432. Source: OSTI; NTIS; INIS; GPO Dep.

This document assesses the performance of the Grout Disposal Facility after closure. The facility and disposal environment are modeled to predict the long-term impacts of the disposal action. The document concludes that the disposal system provides reasonable assurance that doses to the public will remain within the performance objectives. This document is required for DOC Order 5820.2A.

15099 (WHC-SD-WM-ER–394) **Buckling of the Tank 241SY101 primary liner.** Marlow, R.S. Westinghouse Hanford Co., Richland, WA (United States). 19 Dec 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010229. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the computation of the buckling pressure of the primary liner of Tank 241SY101. It describes the calculation of the negative gauge pressure required to buckle the liner. A negative pressure may develop inside the tank when water is sprayed on the hydrogen mitigation pump during its removal. Calculations indicate that the liner will buckle at 23,442 Pa, or 239 cm of water.

15100 (WHC-SD-WM-ER–417) **Sampler bias – Phase 1.** Blanchard, R.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008884. Source: OSTI; NTIS; INIS; GPO Dep.

This documents Phase 1 determinations on sampler induced bias for four sampler types used in tank characterization. Each sampler, grab sampler or bottle-on-a-string, auger sampler, sludge sampler and universal sampler, is briefly discussed and their physical limits noted. Phase 2 of this document will define additional testing and analysis to further define Sampler Bias.

15101 (WHC-SD-WM-ER–431) **Core sampling system spare parts assessment.** Walter, E.J. Westinghouse Hanford Co., Richland, WA (United States). 4 Apr 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010135. Source: OSTI; NTIS; INIS; GPO Dep.

Soon, there will be 4 independent core sampling systems obtaining samples from the underground tanks. It is desirable that these systems be available for sampling during the next 2 years. This assessment was prepared to evaluate the adequacy of the spare parts identified for the core sampling system and to provide recommendations that may remediate overages or inadequacies of spare parts.

15102 (WHC-SD-WM-ES–333) **Clean salt disposition options.** Herting, D.L. (International Technology Corp., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); International Technology Corp., Richland, WA (United States). 29 Mar 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010142. Source: OSTI; NTIS; INIS; GPO Dep.

The proposed waste treatment scheme known as the "Clean Salt Process" would make it possible to extract sodium salts of very low specific activity from Hanford's low level waste currently stored in underground single shell and double shell tanks. This document explores the regulations applicable to a number of disposition options for the recovered sodium salts. The current (baseline) plan is to vitrify the unrecovered sodium salts along with the low level waste from the tanks. Several options are available for disposition of the recovered salts, at far less cost. These options range from beneficial re-use or recycle of the recovered salts to disposal of the recovered salts as mixed waste at an on-site disposal facility. Federal and state regulations governing each disposition option are presented.

15103 (WHC-SD-WM-ETP–058) **Engineering task plan for BX/BY compressor upgrade.** Strand, R.G. Westinghouse Hanford Co., Richland, WA (United States). 7 Feb 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007792. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan outlines the remaining work to be completed for the BX/BY Instrument Air upgrade. Initial work efforts

were guided by Engineering Work Plan, "BX-BY Compressor Upgrade" dated 1-25-93 (see Attachment A) which is provided for information. The overall engineering task is to provide a permanent replacement for the instrument air supply system for the 241-BX/BY Tank Farms. The existing system consists of a 25 horsepower Worthington non-lube compressor and an Oriad air dryer. The existing equipment is dated, requires high maintenance and is located in a contaminated zone making it unusable. The BX/BY instrument air replacement unit will be one of the 100 SCFM generic air stations. This station will be permanently sited with the addition of drawing changes to provide a concrete foundation, air piping to existing lines and electrical power supply tie-ins.

15104 (WHC-SD-WM-ETP–137) **Recommended test program to determine crack growth rate in double-shell tank materials.** Blackburn, L.D. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 10p. DOE Contract AC06-87RL10930. Order Number DE95009098. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the technical rationale and requirements for an experimental program to determine the stress corrosion crack growth rate in double-shell tank materials.

15105 (WHC-SD-WM-ETP–146) **Engineering Task Plan: PUREX cathodic protection system survey and maintenance.** Brezler, T.A. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010049. Source: OSTI; NTIS; INIS; GPO Dep.

Cathodic Protection (CP) was installed on underground transfer lines at the PUREX facility by project B-234 by EBASCO Services Incorporated in 1986. The major components of the CP system are rectifier 02, a series of underground anodes, test stations and reference electrodes buried close to the protected piping. Tank Waste Remediation System (TWRS) Materials and Corrosion Engineering (M&CE) was asked by PUREX to assume responsibility for surveying and maintaining PUREX's CP system. The effectiveness of CP will remain so if properly maintained, which requires periodic measurements and timely corrective action when the measurements show loss of CP. If the system is not well maintained, corrosion failures will eventually occur on the piping protected by the CP system. This engineering task plan establishes an agreement between PUREX and TWRS M&CE to ensure proper operation of the CP system and adherence to the Washington Administrative Codes (WAC).

15106 (WHC-SD-WM-ETP–148) **Engineering Task Plan for inspection of double shell tank farm exhaust ducts.** Nelson, O.D. Westinghouse Hanford Co., Richland, WA (United States). 27 Mar 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010058. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the scope and tasks required to determine the integrity of selected double shell tank exhaust ducts.

15107 (WHC-SD-WM-ISB–003) **340 Waste Handling Facility interim safety basis.** Bendixsen, R.B. Westinghouse Hanford Co., Richland, WA (United States). 3 Apr 1995. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010041. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the interim safety basis (ISB) for the 340 Waste Handling Facility (340 Facility). An ISB is a documented safety basis that provides a justification for the continued operation of the facility until an upgraded final safety analysis report is prepared that complies with US Department of Energy (DOE) Order 5480.23, Nuclear Safety Analysis Reports. The ISB for the 340 Facility documents the current design and operation of the facility. The 340 Facility ISB (ISB-003) is based on a facility walkdown and review of the design and operation of the facility, as described in the existing safety documentation. The safety documents reviewed, to develop ISB-003, include the following: OSD-SW-153-0001, Operating Specification Document for the 340 Waste Handling Facility (WHC 1990); OSR-SW-152-00003, Operating Limits for the 340 Waste Handling Facility (WHC 1989); SD-RE-SAP-013, Safety Analysis Report for Packaging, Railroad Liquid Waste Tank Cars (Mercado 1993); SD-WM-TM-001, Safety Assessment Document for the 340 Waste Handling Facility (Berneski 1994a); SD-WM-SEL-016, 340 Facility Safety Equipment List (Berneski 1992); and 340 Complex Fire Hazard Analysis, Draft (Hughes Assoc. Inc. 1994).

15108 (WHC-SD-WM-OTR–148) **Operability Test Report for 241-T compressed air system and heat pump.** Freeman, R.D. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010072. Source: OSTI; NTIS; INIS; GPO Dep.

This Operability Test Report (OTR) documents the results of functional testing performed on the operating parameters of the 241-T-701 Compressed Air System. The System was successfully installed and tested per work package 2W-92-01172.

15109 (WHC-SD-WM-OTR–151) **Operability Test Report for 241-U Compressed Air System and heat pump.** Rensink, G.E. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010141. Source: OSTI; NTIS; INIS; GPO Dep.

The 241-U-701 compressed air system supplies instrument quality compressed air to Tank Farm 241-U. The system was upgraded. The operability test showed that the system operates within its intended design parameters. System performance was monitored, recorded, and used to identify areas of concern. Exceptions to the OTP and additional items for safe system performance were minimal and have been resolved; the air system is ready for Operation's use.

15110 (WHC-SD-WM-PLN–091) **Tank Waste Remediation System Tank Waste Analysis Plan. FY 1995.** Haller, C.S.; Dove, T.H. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010086. Source: OSTI; NTIS; INIS; GPO Dep.

This documents lays the groundwork for preparing the implementing the TWRS tank waste analysis planning and reporting for Fiscal Year 1995. This Tank Waste Characterization Plan meets the requirements specified in the Hanford Federal Facility Agreement and Consent Order, better known as the Tri-Party Agreement.

15111 (WHC-SD-WM-PROC–014) **KW basin backwash pit sludge measurement/video.** Dodd, E.N. Jr. Westinghouse Hanford Co., Richland, WA (United States). 6 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010083. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this procedure is to gather visual and depth information and monitor underwater activities in the 105-KW SFBWP and transfer channel. Profile lighting (the use of lighting and shadows to show the surface contour) will be used to assess the contour of the sludge surface. Select measurements will also be taken to determine the actual sludge depth. The control/video station will be setup outside the radiation area or in lowest possible exposure area to reduce personnel exposure (ALARA). This procedure is to provide a mechanism to assist in fully characterizing the volume and surface topology of the sludge currently deposited in the sandfilter backwash pit (SFBWP). Surveillance Systems Engineering (SSE) personnel will gather visual information utilizing a closed circuit television (CCTV) color camera, mounted to stainless steel extension poles. Connections allow the camera to be connected with a pan and tilt to allow better positioning capabilities and to get good landscape profiling of the sediment surface. The information will be videotaped to a one-half inch NTSC or Y/C format. Underwater lighting will be accomplished by means of 500 watt underwater lamps.

15112 (WHC-SD-WM-PROC–018) **Assembly procedure for column cutting platform.** Routh, R.D. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009150. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document describes the assembly procedure for the Column Cutting Platform and Elevation Support. The Column

Cutting Platform is a component of the 241-SY-101 Equipment Removal System. It is set up on the deck of the Strongback Trailer to provide work access to cut off the upper portion of the Mitigation Pump Assembly (MPA). The Elevation Support provides support for the front of the Storage Container with the Strongback at an inclined position. The upper portion of the MPA must be cut off to install the Containment Caps on the Storage Container. The storage Container must be maintained in an inclined position until the Containment Caps are installed to prevent any residual liquids from migrating forward in the Storage Container.

15113 (WHC-SD-WM-QAPP–018-Rev.1) **Tank Waste Project Quality Assurance Program Plan. Revision 1.** Clayton, R.E. Westinghouse Hanford Co., Richland, WA (United States). 20 Nov 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010084. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes all the Quality Assurance Program elements required by DOE Order 5700.6C. The elements shall be applied as applicable to specific Tank Waste Projects. A project-specific QAPP shall be issued as a supporting document which shall be used in conjunction with this QAPP. The project specific QAPP shall describe or define any special information, instructions or requirements.

15114 (WHC-SD-WM-RPT–102) **RMCS exhauster data logger configuration.** Waldo, E.J. Westinghouse Hanford Co., Richland, WA (United States). 5 Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010087. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the configuration of the Chessell Model 4200 Data Logger used in the Rotary Mode Core Sampling (RMCS) Exhauster.

15115 (WHC-SD-WM-RPT–118) **Vault 102 cemented waste solidification testing system. Final report.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009156. Source: OSTI; NTIS; INIS; GPO Dep.

This final report presents a summary of all work completed in support of the ultrasonic nondestructive testing of grouted radioactive waste, along with the status of all uncompleted tasks. Tasks were left uncompleted because of the cancellation of the Hanford Grout Disposal Program. Much of the work summarized in this report has been reported on in previous submittals, but is summarized here to provide a more complete understanding of the final status of the overall project.

15116 (WHC-SD-WM-SARR–034) **Safety evaluation for the interim stabilization of Tank 241-C-103.** Geschke, G.R. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009155. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the basis for interim stabilization of tank 241-C-103. The document covers the removal of the organic liquid layer and the aqueous supernatant from tank 241-C-103. Hazards are identified, consequences are calculated and controls to mitigate or prevent potential accidents are developed.

15117 (WHC-SD-WM-SDRR–001) **Compilation of formal comments on the tank farms interim hazard and accident analyses.** Ryan, G.W. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 334p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010080. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of the formal comments on the Tank Farms Interim Hazard and Accident Analyses. This document contains the RCR's that were received and subsequently resolved to develop Rev. A of WHC-SD-WM-SAR-065, Interim Chapter 3.0 Hazard and Accident Analysis.

15118 (WHC-SD-WM-TA–160) **TWRS tank waste pretreatment process development hot test siting report.** Howden, G.F. (Westinghouse Hanford Co., Richland, WA (United States)); Banning, D.L.; Dodd, D.A.; Smith, D.A.; Stevens, P.F.; Hansen, R.I.; Reynolds, B.A. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009100. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the sixth in a series that have assessed the hot testing requirements for TWRS pretreatment process development and identified the hot testing support requirements. This report, based on the previous work, identifies specific hot test work packages, matches those packages to specific hot cell facilities, and provides recommendations of specific facilities to be employed for the pretreatment hot test work. Also identified are serious limitations in the tank waste sample retrieval and handling infrastructure. Recommendations are provided for staged development of 500 mL, 3 L, 25 L and 4000 L sample recovery systems and specific actions to provide those capabilities.

15119 (WHC-SD-WM-TP–259-Rev.1) **Tank 241-C-105 tank characterization plan. Revision 1.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 25 Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008883. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board has advised the DOE to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues. The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling and analytical needs for the resolution of safety issues. Tank C-105 was on the Higher Heat Load Watch List. However, it is presently classified as a non-Watch List low heat load tank and is monitored weekly. This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from Tank 241-C-105.

15120 (WHC-SD-WM-TP–289) **Tank 241-U-105 tank characterization plan.** Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 3 Feb 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007793. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-U-105.

15121 (WHC-SD-WM-TP–299) **Tank 241-TY-101 Tank Characterization Plan.** Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010085. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-TY-101.

15122 (WHC-SD-WM-TP–300) **Tank 241-TY-103 Tank Characterization Plan.** Homi, C.S. Westinghouse Hanford Co., Richland, WA (United States). 16 Mar 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010071. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, Oak Ridge National Laboratory, and PNL tank vapor program. The scope of this plan is to provide guidance for the sampling and analysis of vapor samples from tank 241-TY-103.

15123 (WHC-SD-WM-TP–308) **Tank 241-U-201 tank characterization plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 32p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008416. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 22-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-U-201.

15124 (WHC-SD-WM-TP–309) **Tank 241-U-202 tank characterization plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008415. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-U-202.

15125 (WHC-SD-WM-TP–310) **Tank 241-U-203: Tank Characterization Plan.** Sathyanarayana, P. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 27 Mar 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010138. Source: OSTI; NTIS; INIS; GPO Dep.

The revised Federal Facility Agreement and Consent Order states that a tank characterization plan will be developed for each double-shell tank and single-shell tank using the data quality objective process. The plans are intended to allow users and regulators to ensure their needs will be met and resources are devoted to gaining only necessary information. This document satisfies that requirement for Tank 241-U-203 sampling activities.

15126 (WHC-SD-WM-TP–330) **Compatibility Grab Sampling and Analysis Plan.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 10 Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010807. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for the purpose of compatibility.

15127 (WHC-SD-WM-WP–132-Rev.5) **Tank Farm Instrumentation and Data Acquisition/Management Upgrade Plan. Revision 5.** Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 27 Mar 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010059. Source: OSTI; NTIS; INIS; GPO Dep.

This plan provides the strategy, implementation, and schedule for upgrading tank farm instrumentation, data acquisition and data management. The focus is on surveillance parameters to verify and maintain tank safety. The criteria do not necessarily constitute mandatory requirements but are based upon engineering judgment and best available information. Schedules reflect current funding for FY95. For out years they are best engineering judgment.

15128 (WHC-SP–1143) **Tank waste remediation system high-level waste feed processability assessment report.** Lambert, S.L. (Westinghouse Hanford Co., Richland, WA (United States)); Kim, D.S. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 279p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008029. Source: OSTI; NTIS; INIS; GPO Dep.

This study evaluates the effect of feed composition on the performance of the high-level vitrification process. It is assumed in this study that the tank wastes are retrieved and blended by tank farms, producing 12 different blends from the single-shell tank farms, two blends of double-shell tank waste, and a separately defined all-tank blend. This blending scenario was chosen only for evaluating the impact of composition on the volume of high- level waste glass produced. Special glass compositions were formulated for each waste blend based on glass property models and the properties of similar glasses. These glasses were formulated to meet the applicable viscosity, electrical conductivity, and liquidus temperature constraints for the identified candidate melters. Candidate melters in this study include the low-temperature stirred melter, which operates at 1050°C; the reference Hanford Waste Vitrification Plant liquid-fed ceramic melter, which operates at 1150°C; and the high-temperature, joule-heated melter and the cold-crucible melter, which operate over a temperature range of 1150°C to 1400°C. In the most conservative case, it is estimated that 61,000 MT of glass will be produced if the Site's high-level wastes are retrieved by tank farms and processed in the reference joule-heated melter. If an all-tank blend was processed under the same conditions, the reference melter would produce 21,250 MT of glass. If cross-tank blending were used, it is anticipated that $2.0 billion could be saved in repository disposal costs (based on an average disposal cost of $217,000 per canister) by blending the S, SX, B, and T Tank Farm wastes with other wastes prior to vitrification. General blending among all the tank farms is expected to produce great potential benefit.

15129 (WSRC-MS–94-0604) **Resistance Weld Qualifcation Analysis for Radioactive Waste Canisters.** Gupta, N.K.; Gong, C. Westinghouse Savannah River Co., Aiken, SC (United States). 10 Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950740–6: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95060079. Source: OSTI; NTIS; INIS; GPO Dep.

High level radioactive waste canisters are sealed by resistance upset welding to ensure leak tight closures. Resistance welding is fast, uniform, and can be performed remotely to minimize radiation exposure to the operators. Canisters are constructed in accordance with ASME Band PV Code, Section VIII, Division 1, however, the resistance welds are not used in Section VIII. The resistance welds are qualified by analysis using material properties obtained from the test coupons. Burst tests are performed on canister welds to meet ASME Section IX welder qualification requirements. Since burst tests are not used in Section IX for resistance weld qualification, finite element results of canister resistance welds are compared with the finite element analysis results of resistance weld tests in ASME Section IX, QW-196 to establish similarity between the two weld tests. Detailed analyses show that the primary mode of failure in both the tests is shear and, therefore, the use of burst test in place of shear test is acceptable. It is believed that the detailed analyses and results could help in establishing acceptance criteria for resistance upset welding in ASME B&PV Code, Sections VIII, and IX.

15130 (WTD–92-046) **Waste management facilities cost information estimating data.** Feizollahi, F. (Morrison-Knudsen Corp., Boise, ID (United States). Environmental Services Div.); Shropshire, D. EG and G Idaho, Inc., Idaho Falls, ID (United States); Morrison-Knudsen Corp., Boise, ID (United States). Environmental Services Div. Oct 1992. 319p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95009462. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains cost estimating support data for the Waste Management Facility Cost Information (WMFCI) task. The WMFCI task was commissioned by the U.S. Department of Energy (DOE) to develop planning level life-cycle cost (PLCC) estimates for treatment, storage, and disposal facilities. The report contains PLCC estimates versus capacity for 26 different facility cost modules. Estimates in the report apply to five distinctive waste streams: low-level waste, low-level mixed waste, alpha contaminated low-level waste, alpha contaminated low-level mixed waste, and transuranic waste. The report addresses five different treatment types: incineration, metal/melting and recovery, shredder/compaction, solidification, and vitrification.

15131 (Y/EN–5289/V4) **Final report from VFL Technologies for the pilot-scale thermal treatment of lower East Fork Poplar Creek floodplain soils. LEFPC appendices, Volume 4, Appendix V-C.** Oak Ridge National Lab., TN (United States). Sep 1994. 402p. Sponsored by USDOE, Washington, DC (United States).

DOE Contract AC05-84OR21400. Order Number DE95009188. Source: OSTI; NTIS; GPO Dep.

This is the the final verification run data package for pilot scale thermal treatment of lower East Fork Poplar Creek floodplain soils. Included are data on volatiles, semivolatiles, and TCLP volatiles.

15132 (YJT–94-16) **Validation of a numerical release model (REPCOM) for the finnish operating waste disposal systems. Part VI: Intermediate results from the laboratory measurements 1986-1993.** Olin, M. (VTT Chemical Technology, Espoo (Finland)). Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Sep 1994. 38p. Order Number DE95627053. Source: OSTI; NTIS; INIS.

In Finland the operating waste from four nuclear power plant units will be disposed of in two repositories to be built in the granitic bedrock at the two power plant sites. The aim of this work is to model experimentally the inner structures and materials of the reactor waste repositories and to use the results for the validation of a numerical near field release model, REPCOM. The laboratory arrangements included the following test materials: bitumenized and cemented ion-exchange resin, concrete, crushed rock, and water corresponding to materials in the existing and planned disposal systems. ^{137}Cs, ^{60}Co, ^{85}Sr, and ^{90}Sr were used as tracers, with which the ion-exchange resin, water or crushed rock was labelled depending on the specimen type. (7 refs., 43 figs.).

15133 (YJT–94-21) **Application of the RES methodology for identifying features, events and processes (FEPs) for near-field analysis of copper-steel canister.** Vieno, T. (VTT Energy, Espoo (Finland)); Hautojaervi, A.; Raiko, H.; Ahonen, L.; Salo, J.P. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Dec 1994. 41p. Order Number DE95627054. Source: OSTI; NTIS; INIS.

Rock Engineering Systems (RES) is an approach to discover the important characteristics and interactions of a complex problem. Recently RES has been applied to identify features, events and processes (FEPs) for performance analysis of nuclear waste repositories. The RES methodology was applied to identify FEPs for the near-field analysis of the copper-steel canister for spent fuel disposal. The aims of the exercise were to learn and test the RES methodology and, secondly, to find out how much the results differ when RES is applied by two different groups on the same problem. A similar exercise was previously carried out by a SKB group. A total of 90 potentially significant FEPs were identified. The exercise showed that the RES methodology is a practicable tool to get a comprehensive and transparent picture of a complex problem. The approach is easy to learn and use. It reveals the important characteristics and interactions and organizes them in a format easy to understand. (9 refs., 5 figs., 3 tabs.).

15134 (YJT–94-22) **Literature study on the microstructure of bentonite and its effect on diffusion.** Muurinen, A. (VTT Chemical Technology, Espoo (Finland)); Lehikoinen, J.; Pusch, R. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Dec 1994. 96p. Order Number DE95627055. Source: OSTI; NTIS; INIS.

In the study the available information from the literature on the microstructural properties of bentonite and its main component montmorillonite have been compiled, together with different phenomena which have been found to participate in the diffusion process in bentonite. (167 refs., 36 figs., 6 tabs.).

15135 (Y/SUB–94-99069C/Y15/11) **Underground storage tank management plan.** Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Sep 1994. 414p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009520. Source: OSTI; NTIS; INIS; GPO Dep.

The Underground Storage Tank (UST) Management Program at the Oak Ridge Y-12 Plant was established to locate UST systems in operation at the facility, to ensure that all operating UST systems are free of leaks, and to establish a program for the removal of unnecessary UST systems and upgrade of UST systems that continue to be needed. The program implements an integrated approach to the management of UST systems, with each system evaluated against the same requirements and regulations. A common approach is employed, in accordance with Tennessee Department of Environment and Conservation (TDEC) regulations and guidance, when corrective action is mandated. This Management Plan outlines the compliance issues that must be addressed by the UST Management Program, reviews the current UST inventory and compliance approach, and presents the status and planned activities associated with each UST system. The UST Management Plan provides guidance for implementing TDEC regulations and guidelines for petroleum UST systems. (There are no underground radioactive waste UST systems located at Y-12.) The plan is divided into four major sections: (1) regulatory requirements, (2) implementation requirements, (3) Y-12 Plant UST Program inventory sites, and (4) UST waste management practices. These sections describe in detail the applicable regulatory drivers, the UST sites addressed under the Management Program, and the procedures and guidance used for compliance with applicable regulations.

15136 (Y/SUB–94-EAQ10C/2/P2) **Calendar year 1993 groundwater quality report for the Upper East Fork Poplar Creek hydrogeologic regime Y-12 Plant, Oak Ridge, Tennessee: 1993 groundwater quality data interpretations and proposed program modifications.** Oak Ridge National Lab., TN (United States). Oct 1994. 176p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009199. Source: OSTI; NTIS; INIS; GPO Dep.

This Groundwater Quality Report (GWQR) contains an evaluation of the groundwater quality data obtained during the 1993 calendar year (CY) at the U.S. Department of Energy (DOE) Y-12 Plant located on the DOE Oak Ridge Reservation (ORR) southeast of Oak Ridge, Tennessee (Figure 1). The groundwater quality data are presented in Part 1 of the GWQR submitted by Martin Marietta Energy Systems, Inc. (Energy Systems) to the Tennessee Department of Environment and Conservation (TDEC) in February 1994 (HSW Environmental Consultants, Inc. 1994a). Groundwater quality data evaluated in this report were obtained at several hazardous and non-hazardous waste management facilities and underground storage tanks (USTS) located within the Upper East Fork Poplar Creek Hydrogeologic Regime (East Fork Regime). The Environmental Management Department of the Y-12 Plant Health, Safety, Environment, and Accountability Organization manages the groundwater monitoring activities in each regime under the auspices of the Y-12 Plant Groundwater Protection Program (GWPP). The purpose of the GWPP is to characterize the hydrogeology and to monitor groundwater quality at the Y-12 Plant and surrounding area to provide for protection of groundwater resources consistent with federal, state, and local requirements and in accordance with DOE Orders and Energy Systems corporate policy. The annual GWQR for the East Fork Regime is completed in two parts. Part 1 consists primarily of data appendices and serves as a reference for the groundwater quality data obtained each CY under the lead of the Y-12 Plant GWPP. Part 2 (this report) contains an evaluation of the data with respect to regime-wide groundwater quality, presents the findings and status of ongoing hydrogeologic studies, describes changes in monitoring priorities, and presents planned modifications to the groundwater sampling and analysis program for the following calendar year.

15137 (Y/SUB/WM–213) **Construction quality assurance report for the Y-12 Construction/Demolition Landfill VII (CDL VII), Oak Ridge, Tennessee.** Burton, P.M. (Burns and McConnel Waste Consultants, Inc., Overland Park, KS (United States)). Oak Ridge Y-12 Plant, TN (United States); Burns and McConnel Waste Consultants, Inc., Overland Park, KS (United States). Nov 1994. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-90OR21860 ; AC05-84OR21400. Order Number DE95009186. Source: OSTI; NTIS; INIS; GPO Dep.

This Construction Quality Assurance (CQA) Report provides documentation that Bid Option 2 of the Y-12 Plant Construction Demolition Landfill 7 (CDL-7) was constructed in substantial compliance with the Tennessee Department of Environment and Conservation (TDEC) approved design, as indicated and specified in the permit drawings, approved changes, and specifications. CDL-7 is located in Anderson County on the south side of Chestnut Ridge, approximately 0.5 miles south of the Y-12 Plant in Oak Ridge, Tennessee. This report applies specifically to the limits of

excavation for Area No. 1 portions of the perimeter maintenance road and drainage channel and Sedimentation Pond No. 3. A partial "As-Built" survey was performed and is included.

15138 (Y/TS–1022) **Evaluation of cavity occurrence in the Maynardville Limestone and the Copper Ridge Dolomite at the Y-12 Plant using logistic and general linear models.** Shevenell, L.A. (Univ. of Nevada, Reno, NV (United States). Nevada Bureau of Mines and Geology); Beauchamp, J.J. Oak Ridge National Lab., TN (United States). Nov 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009057. Source: OSTI; NTIS; GPO Dep.

Several waste disposal sites are located on or adjacent to the karstic Maynardville Limestone (Cmn) and the Copper Ridge Dolomite (Ccr) at the Oak Ridge Y-12 Plant. These formations receive contaminants in groundwaters from nearby disposal sites, which can be transported quite rapidly due to the karst flow system. In order to evaluate transport processes through the karst aquifer, the solutional aspects of the formations must be characterized. As one component of this characterization effort, statistical analyses were conducted on the data related to cavities in order to determine if a suitable model could be identified that is capable of predicting the probability of cavity size or distribution in locations for which drilling data are not available. Existing data on the locations (East, North coordinates), depths (and elevations), and sizes of known conduits and other water zones were used in the analyses. Two different models were constructed in the attempt to predict the distribution of cavities in the vicinity of the Y-12 Plant: General Linear Models (GLM), and Logistic Regression Models (LOG). Each of the models attempted was very sensitive to the data set used. Models based on subsets of the full data set were found to do an inadequate job of predicting the behavior of the full data set. The fact that the Ccr and Cmn data sets differ significantly is not surprising considering the hydrogeology of the two formations differs. Flow in the Cmn is generally at elevations between 600 and 950 ft and is dominantly strike parallel through submerged, partially mud-filled cavities with sizes up to 40 ft, but more typically less than 5 ft. Recognized flow in the Ccr is generally above 950 ft elevation, with flow both parallel and perpendicular to geologic strike through conduits, which tend to be large than those on the Cnm, and are often not fully saturated at the shallower depths.

15139 (Y/TS–1263) **Analysis of well hydrographs in a karst aquifer: Estimates of specific yields and continuum transmissivities.** Shevenell, L.A. (Univ. of Nevada, Reno, NV (United States). Nevada Bureau of Mines and Geology). Oak Ridge National Lab., TN (United States). Nov 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009059. Source: OSTI; NTIS; GPO Dep.

Hydrograph analysis techniques have been well developed for hydrographs obtained from streams and springs, where data are cast in terms of total discharge. The data obtained from well hydrographs provide water level versus time; hence, a method of hydrograph analysis is required for situations in which only water level data are available. It is hypothesized here that three segments on a recession curve from wells in a karst aquifer represent drainage from three types of storage: conduit (C), fracture (F), and matrix (M). Hydrographs from several wells in a karst aquifer at the U.S. Department of Energy Oak Ridge Y-12 Plant are used to estimate the specific yields (S_y) associated with each portion of the aquifer (C, F, M), as well as continuum transmissivities (T). Data from three short injection tests at one well indicate continuum T at this well bore is $\sim 5 m^2/d$, and tests at numerous other wells in the aquifer yield results between 1 and 7 M^2/d. The T estimated with well hydrographs from two storm events indicates a T of 9.8 $m^2 2/d$. Well developed conduit systems in which water levels in wells show a flashy response typically show S_y values of 1×10^{-4}, 1×10^{-3}, and 3×10^{-3}, for C, F, and M. Less well developed conduit areas show more nearly equal S_y values (8.6×10^{-4}, 1.3×10^{-3}, 3×10^{-3}). Areas with no evidence for the presence of conduits have only one, or in some cases two, slopes on the recession curve. In these cases, water level responses are slow. Recession curves with a single slope represent drainage from only the lower T matrix. Those with two slopes have an additional, more rapid response, segment on the recession curve, which represents drainage from the higher T, lower S_y, fractures in the system.

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Refer also to citation(s) 14949, 14963, 14973, 14998, 15064, 16123, 16553, 16570

15140 (DOE/AL/62350–130) **Comment and response document for the UMTRA Project vitro processing site completion report Salt Lake City, Utah. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1995. 499p. DOE Contract AC04-91AL62350. (DOE/AL/62350–129-Rev.1). Order Number DE95009880. Source: OSTI; NTIS; INIS; GPO Dep.

This Comment and Response Document is a series of UMTRA document review forms regarding the UMTRA Project Vitro Processing Site Completion Report for Salt Lake City, Utah in March, 1995. The completion report provides evidence that the final Salt Lake City, Utah, processing site property conditions are in accordance with the approved design and that all U.S. Environmental Protection Agency (EPA) standards have been satisfied. Included as appendices to support the stated conclusions are the record drawings; a summary of grid test results; contract specifications and construction drawings, the EPA standards (40 CFR Part 192); the audit, inspection, and surveillance summary; the permit information; and project photographs. The principal objective of the remedial action at Salt Lake City is to remove the tailings from the processing site, render the site free of contamination to EPA standards, and restore the site to the final design grade elevations. Each section is evaluated in detail to check all aspects of above report, especially the inclusion of adequate verification data. Each review form contains a section entitled State of Utah Response and Action, which is an explanation or correction of DOE criticisms of the report.

15141 (DOE/AL/62350–159/2/95) **Site Observational Work Plan for the UMTRA project site at Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1995. 498p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009461. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water compliance for the Uranium Mill Tailings Remedial Action (UMTRA) Project sites, including the Ambrosia Lake, New Mexico, site, is governed by the Uranium Mills Tailings Radiation Control Act (42 USC §7901 et seq.) and the U.S. Environmental Protection Agency's Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192; 60 FR 2854). The EPA standards describe specific conditions for which the U.S. Department of Energy (DOE) may apply for supplemental standards for contaminated ground water rather than meeting background levels or numerical standards. To achieve compliance with Subpart A of the EPA standards the residual radioactive materials are currently being consolidated on the site by the DOE in a disposal cell, isolating them from direct human or ecological contact and further dispersion into the environment. Completion of the disposal cell is scheduled for early 1995. An environmental assessment and a Finding of No Significant Impact (FONSI) were completed in 1987. Concurrence with the UMTRA Surface Project Ambrosia Lake remedial action plan (RAP) was granted by the U.S. Nuclear Regulatory Commission (NRC) and state of New Mexico in 1990. The DOE deferred compliance with Subpart B of the EPA standards in the Surface Project RAP. This site observational work plan (SOWP) is the first document to address ground water compliance under Subpart B at the Ambrosia Lake site. The Ambrosia Lake UMTRA Project site is within the Grants Mineral Belt and was one of numerous uranium mills supplied by many local mines. Ground water contamination at the site occurred as a result of uranium mill operations. Contamination of ground water resulted from discharge of waste water, infiltration of water through the tailings pile, hydraulic placement of mill tailings in nearby mines, and water pumped from mine shafts.

15142 (DOE/NV/11432–167) **U.S. Department of Energy, Nevada Operations Office, Environmental Monitoring Program: Summary data report - first and second calendar quarters**

1994. Black, S.C.; Glines, W.M.; Townsend, Y.E. (eds.). Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Nov 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95009439. Source: OSTI; NTIS; INIS; GPO Dep.

During the first and second quarters of 1994 air samples were collected and analyzed from 54 air particulate/halogen sampling stations, 10 noble gas sampling stations and 19 tritiated water vapor sampling stations. Surface water samples were collected and analyzed from 12 open water supply reservoirs, 8 natural springs, 2 wastewater containment ponds and 9 sewage lagoons. Groundwater samples were obtained brom 10 potable and 1 non-potable supply wells, and 8 drinking water consumption points. Ambient radiation levels were measured at 193 locations.

15143 (DOE/RL–93-81) **Limited field investigation report for the 100-NR-2 Operable Unit, Hanford Site, Richland, Washington.** USDOE Richland Operations Office, WA (United States). Mar 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009565. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) was conducted to.determine the nature and extent of hazardous and radioactive materials present in the groundwater. This information is used to assess the applicability of interim remedial measures (IRM) for reducing human health and environmental risks within the 100-NR-2 Groundwater Operable Unit. Sampling of existing wells and the installation of one new monitoring well were the methods of investigation used during this LFI. Analytical data were subjected to validation under the Resource Conservation and Recovery Act (RCRA) program. The groundwater analyses were screened to identify contaminants of potential concern (COPC). This screening method eliminated from further consideration constituents that were below background. Constituents considered nontoxic to humans were eliminated from the human health evaluation. Data inconsistency and blank contamination were also evaluated in the screening process. These COPC were evaluated further in the qualitative risk assessment (QRA). A QRA was performed using conservative analyses. The human health risk assessment evaluated frequent-use and occasional-use scenarios. The QRA analysis indicates that there is a medium human health risk for the frequent-use scenario and a low human health risk for the occasional-use scenario. Neither of these land use scenarios currently occur at the site.

15144 (DOE/RL–94-59-Draft-A) **100-BC-5 operable unit focused feasibility study report. Draft A.** Bechtel Hanford, Inc., Richland, WA (United States). Oct 1994. 513p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009557. Source: OSTI; NTIS; INIS; GPO Dep.

This focused feasibility study report presents the detailed analysis of alternatives for both interim remedial measures and potential future actions for the 100-BC-5 operable Unit. The limited investigation recommended that the operable unit be removed from the IRM pathway as defined in the Hanford Past-Practice Strategy. The FFS was initiated in support of a final action. In the course of evaluating alternatives, it was recognized that the data were insufficient to support a final action. Consequently, the unit managers decided to complete the document as an interim FFS to document the modeling and evaluation efforts done to date. The potential contaminant of interest in the operable unit for a final action would be Sr-90, with a calculated incremental cancer risk of 2E-06 based on an occasional-use exposure scenario and which exceeds the Safe Drinking Water Act maximum contaminant level in the near-river wells. The modeling to support the evaluation of alternatives was based on Sr-90 data from groundwater monitoring wells in the operable unit. The 100-BC-5 unit is one of three operable units associated with the 100 B/C Area of the site. Two of the 100 B/C operable units are source units. The 100-BC-5 Groundwater Operable Unit includes the groundwater beneath the source operable units and the adjacent groundwater, surface water, fluvial sediments, and aquatic biota impacted by the overlying source operable unit. The key assumptions which form the basis for the FFS are: addressing an identified threat to human health or the environment; protecting the Columbia River and to abate offsite migration of contaminants; containment and control of contaminant plumes; occasional-use scenario is assumed for the operable unit; a finite lifecycle for the IRM to the year 2008; the 100 Area Feasibility Study Phases I & 2 forms the basis for the alternatives evaluated in the FFS; disposal to the Environment Restoration Disposal Facility is assumed for all solid wastes generated.

15145 (ES/ESH–50) **Portsmouth Gaseous Diffusion Plant annual site environmental report for 1993.** Horak, C.M. (ed.). Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Martin Marietta Energy Systems, Inc., Piketon, OH (United States). Nov 1994. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00001. (POEF–3050). Order Number DE95006673. Source: OSTI; NTIS; INIS; GPO Dep.

This calendar year (CY) 1993 annual report on environmental monitoring of the US Department of Energy's (DOE's) Portsmouth Gaseous Diffusion Plant (Portsmouth) and its environs consists of three separate documents: a summary pamphlet for the general public; a more detail discussion and of compliance status, data, and environmental impacts (this document); and a volume of detailed data that is available on request. The objectives of this report are to report compliance status during 1993; provide information about the plant site and plant operations; report 1993 monitoring data for the installation and its environs that may have been affected by operations on the plant site; document information on input and assumptions used in calculations; provide trend analyses (where appropriate) to indicate increases and decreases in environmental impact, and provide general information on quality assurance for the environmental monitoring program.

15146 (PNL–10484) **In situ mapping of radionuclides in subsurface and surface soils: 1994 Summary report.** Schilk, A.J.; Hubbard, C.W.; Knopf, M.A.; Abel, K.H. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010407. Source: OSTI; NTIS; INIS; GPO Dep.

Uranium production and support facilities at several DOE sites occasionally caused local contamination of some surface and subsurface soils. The thorough cleanup of these sites is a major public concern and a high priority for the US Department of Energy, but before any effective remedial protocols can be established, the three-dimensional distributions of target contaminants must be characterized. Traditional means of measuring radionuclide activities in soil are cumbersome, expensive, time-consuming, and often do not accurately reflect conditions over very large areas. New technologies must be developed, or existing ones improved, to allow cheaper, faster, and safer characterization of radionuclides in soils at these sites. The Pacific Northwest Laboratory (PNL) was tasked with adapting, developing, and demonstrating technologies to measure uranium in surface and subsurface soils. In partial completion of this effort, PNL developed an improved in situ gamma-ray spectrometry system to satisfy the technical requirements. This document summarizes fiscal-year 1994 efforts at PNL to fulfill requirements for TTP #321103 (project #19307). These requirements included (a) developing a user-friendly software package for reducing field-acquired gamma-ray spectra, (b) constructing an improved data-acquisition hardware system for use with high-purity germanium detectors, (c) ensuring readiness to conduct field mapping exercises as specified by the sponsor, (d) evaluating the in situ gamma-ray spectrometer for the determination of uranium depth distribution, and (e) documenting these efforts.

15147 (RFP–4935) **Modeling one-dimensional unsaturated flow at the Rocky Flats Environmental Technology Site near Golden, Colorado.** Thompson, J.S. (EG and G Rocky Flats, Inc., Golden, CO (United States)); Zeiler, R.M. EG and G Rocky Flats, Inc., Golden, CO (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-9505188–2: 1995 American Institute of Hydrology annual meeting, Denver, CO (United States), 14-18 May 1995). Order Number DE95009113. Source: OSTI; NTIS; INIS; GPO Dep.

A field investigation characterizing contamination at the Rocky Flats Plant (Rocky Flats Environmental Technology Site) near

Golden, Colorado revealed unexpectedly high moisture contents in the unsaturated soil column (vadose zone) beneath several of the Plant's Waste Water Treatment Plant (WWTP) sludge drying beds. Because these beds were seldom in use, researchers had hypothesized that the water required to maintain the saturated conditions observed beneath several of the sludge drying beds was coming from sources other than the beds themselves. In an effort to substantiate this hypothesis, a one-dimensional physically-based unsaturated flow model was utilized to simulate the vertical movement of moisture from the sludge drying beds into the unsaturated soil column below. The model was run to simulate vertical flow over a two-year period and results indicated that no significant changes from initial conditions were apparent. This evidence supports the hypothesis that the high moisture contents found beneath the sludge drying beds are being fed by sources other than infiltration of sludge applied to the beds themselves. This paper presents the details of the simulation and provides further evidence of the hypothesized flow regime.

15148 (UCRL-JC–119115) **Reaction progress pathways for glass and spent fuel under unsaturated conditions.** Bates, J.; Finn, P.; Bourcier, W.; Stout, R. Lawrence Livermore National Lab., CA (United States). Oct 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950570–17: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95009472. Source: OSTI; NTIS; INIS; GPO Dep.

The source term for the release of radionuclides from a nuclear waste repository is the waste form. In order to assess the performance of the repository and the engineered barrier system (EBS) compared to regulations established by the Nuclear Regulatory Commission and the Environmental Protection Agency it is necessary (1) to use available data to place bounding limits on release rates from the EBS, and (2) to develop a mechanistic predictive model of the radionuclide release and validate the model against tests done under a variety of different potential reaction conditions. The problem with (1) is that there is little experience to use when evaluating waste form reaction under unsaturated conditions such that errors in applying expert judgment to the problem may be significant. The second approach, to test and model the waste form reaction, is a more defensible means of providing input to the prediction of radionuclide release. In this approach, information related to the source term has a technical basis and provides a starting point to make reasonable assumptions for long-term behavior. Key aspects of this approach are an understanding of the reaction progress mechanism and the ability to model the tests using a geochemical code such as EQ3/6. Current knowledge of glass, UO_2, and spent fuel reactions under different conditions are described below.

15149 (USGS-OFR–94-451) **Summary of lithologic logging of new and existing boreholes at Yucca Mountain, Nevada, March 1994 to June 1994.** Geslin, J.K.; Moyer, T.C. Geological Survey, Denver, CO (United States). 1995. 16p. Sponsored by Geological Survey, Reston, VA (United States);USDOE, Washington, DC (United States). DOE Contract AI08-92NV10874. Order Number DE95009443. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes lithologic logging of core from boreholes at Yucca Mountain, Nevada, conducted from March 1994 to June 1994. Units encountered during logging include Quaternary-Tertiary alluvium and colluvium, Tertiary Rainier Mesa Tuff, all units in the Tertiary Paintbrush Group, and Tertiary Calico Hills Formation. Logging results are presented in a table of contact depths for core from unsaturated zone neutron (UZN) boreholes and graphic lithologic logs for core from north ramp geology (NRG) boreholes.

15150 (WHC-EP–0741) **Final report: Fiscal Year 1993 activities for the Line Loss Study.** Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010068. Source: OSTI; NTIS; INIS; GPO Dep.

Deficiencies in air monitoring and sampling systems at WHC, identified in WHC Compliance Plan CP89-16, include line loss quantification, potential proportional sampling errors, quantification of sampling/measurement system bias, and overall system calibrations. 'Tiger Team' assessment number A/BMPF-3 identifies line losses as a potential for large sampling errors. The objective of the work performed during FY 1993 was to provide reports and assessments for specific stack sampling systems on the associated particle line loss for those sampling lines.

15151 (WHC-EP–0852) **Final report on fiscal year 1994 activities for the line loss study.** Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010066. Source: OSTI; NTIS; INIS; GPO Dep.

The Line Loss study has been a four-year effort to provide data and analysis for air monitoring and sampling systems at Hanford. This document presents the results of measurements obtained from the Plutonium-Uranium Extraction (PUREX) Plant and T Plant Main Stacks obtained during FY 1994. The work performed during FY 1994 was consistent with the action plans contained in Compliance Plan CP89-16. The study was initiated in 1991 in response to Tiger Team items A/CF-1 and A/BMPF-3 regarding representative sampling for the stack record samplers at some of the main Hanford Site stacks. Representative sampling is a compliance requirement for 40 CFR 61. The US EPA Compliance Order and Information Request received by the US DOE Richland Operations Office (RL) in February, 1993, also requested scheduling information for the study. RL received a letter in September, 1993, from the EPA stating their current views that estimates of line losses are considered adequate for the 40 CFR 61 Subpart H-affected stacks. The EPA has no further formal interest in the study, although they are still interested in receiving results of the study. The work performed during FY 1991 and FY 1992 generated the initial data on line losses and assisted in the development of evaluation and assessment methods that could be used to determine potential line losses in other Hanford stack monitoring systems. The work performed during FY 1993 included measurements on sampling lines associated with the PUREX Main Stack and the B Plant Main Stack. The cascade impactor measurements on the PUREX Main Stack were repeated during FY 1994 because of operational problems during the FY 1993 measurements. The analyses for the B Plant samples had not been received before the delivery date for the final report on the FY 1993 activities. The decision was made to publish a separate report specifically for the B Plant results during FY 1994 after the results had been received from the laboratory and verified.

15152 (WHC-SD-W007H-OTP–001) **Operability test procedure for the TK-900 beta/gamma liquid effluent monitoring system.** Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Feb 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008420. Source: OSTI; NTIS; INIS; GPO Dep.

This operability test procedure will verify that the 221-B beta/gamma liquid effluent monitoring system, installed near the east end of the six inch chemical sewer header, functions as intended by design. An off-line, skid mounted, beta/gamma radiation monitor and pH monitor was installed near stairwell three in the 221-B electrical gallery by Project W-007H. The skid mounted monitoring system includes two radiation detectors and a pH meter, both with local digital displays. Output signals from each monitor are also received and displayed by the Facility Process Monitor and Control System (FPMCS). Pumps, motors, gauges, valves and transport lines complement the skid monitoring system. The system is part of BAT/AKART for the BCE liquid effluent system.

15153 (Y/EN–5288) **Final report for the pilot-scale thermal treatment of Lower East Fork Poplar Creek floodplain soils.** Oak Ridge Y-12 Plant, TN (United States); IT Corp., Knoxville, TN (United States). Sep 1994. 432p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009046. Source: OSTI; NTIS; GPO Dep.

IT Corporation (IT) was contracted by Martin Marietta Energy Systems, Inc. (Energy Systems) to perform a pilot-scale demonstration of the effectiveness of thermal desorption as a remedial technology for removing mercury from the Lower East Fork Poplar Creek (LEFPC) floodplain soil. Previous laboratory studies by Energy Systems suggested that this technology could reduce mercury

to very low levels. This pilot-scale demonstration study was initiated to verify on an engineering scale the performance of thermal desorption. This report includes the details of the demonstration study, including descriptions of experimental equipment and procedures, test conditions, sampling and analysis, quality assurance (QA), detailed test results, and an engineering assessment of a conceptual full-scale treatment facility. The specific project tasks addressed in this report were performed between October 1993 and June 1994. These tasks include soil receipt, preparation, and characterization; prepilot (bench-scale) desorption tests; front-end materials handling tests; pilot tests; back-end materials handling tests; residuals treatment; and engineering scale-up assessment.

15154 (Y/EN–5289/V2) **Final report from VFL technologies for the pilot-scale thermal treatment of Lower East Fork Poplar Creek floodplain soils. LEFPC Appendices, Volume 2, Appendix V-A.** Oak Ridge Y-12 Plant, TN (United States); VFL Technology Corp., Malvern, PA (United States). Sep 1994. 509p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009194. Source: OSTI; NTIS; GPO Dep.

This document contains information concerning validation of analytical data for the pilot-scale thermal treatment of Lower East Fork Poplar Creek Floodplain soils located at the Y-12 Plant site. This volume is an appendix of compiled data from this validation process.

15155 (Y/EN–5289/V5) **Final report from VFL Technologies for the pilot-scale thermal treatment of Lower East Fork Poplar Creek floodplain soils. LEFPC appendices. Volume 5. Appendix V-D.** Oak Ridge National Lab., TN (United States). Sep 1994. 350p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009049. Source: OSTI; NTIS; INIS; GPO Dep.

This final report from VFL Technologies for the pilot-scale thermal treatment of lower East Fork Poplar Creek floodplain soils dated September 1994 contains LEFPC Appendices, Volume 5, Appendix V - D. This appendix includes the final verification run data package (PAH, TCLP herbicides, TCLP pesticides).

15156 (Y/EN–5289/V6) **Final report from VFL Technologies for the pilot-scale thermal treatment of Lower East Fork Poplar Creek floodplain soils. LEFPC appendices. Volume 6. Appendix VI-X.** Oak Ridge National Lab., TN (United States). Sep 1994. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009048. Source: OSTI; NTIS; INIS; GPO Dep.

This final report from VFL Technologies for the pilot-scale thermal treatment of lower East Fork Poplar Creek floodplain soils dated September 1994 contains LEFPC Appendices, Volume 6, Appendix VI - X. These appendices cover the following areas: chain of custody, miscellaneous process calculations (residence time and orifice plate calculations), waste management (mercury and radiation confirmatory testing before and after final verification run), health and safety (training, respirator fit test and radiation work permits), and transportation (soil receipt documentation).

15157 (Y/SUB–94-99069C(Y13)/1) **Fiscal year 1994 well installation program summary report, Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Sep 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009056. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the well installation activities conducted during the federal fiscal year (FY) 1994 drilling program at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Synopses of monitoring well construction/well development data, well location rationale, geological/hydrological observations, quality assurance/quality control methods, and health and safety monitoring are included. Two monitoring wells were installed and one piezometer installation was attempted, but not completed, during the FY 1994 drilling program. In addition, SAIC provided health and safety and geotechnical oversight for two soil borings in support of the Y-12 Underground Storage Tank (UST) Program. All new monitoring wells were developed by either a 2.0-in. diameter swab rig or by hand bailing until nonspecific indicator parameters (pH and specific conductance) attained steady-state levels. Turbidity levels were lowered, if required, to the extent practicable by continued development beyond a steady-state level of pH and conductance. All well installation was conducted following industry-standard methods and approved procedures in the Environment Surveillance Procedures Quality Control Program (Energy Systems 1988), the Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document (EPA 1986), and Guidelines for Installation of Monitor Wells at the Y-12 Plant (Geraghty and Miller 1985). Health and safety monitoring and field screening of drilling returns and development waters were conducted in accordance with approved Martin Marietta Energy Systems, Inc. (Energy Systems) guidelines. All of the monitoring wells installed during FY 1994 at the Y-12 Plant were of screened construction.

15158 (Y/SUB–94/EAQ10C/3/P2) **Calendar year 1993 groundwater quality report for the Chestnut Ridge Hydrogeologic Regime Y-12 Plant, Oak Ridge, Tennessee. 1993 Groundwater quality data interpretations and proposed program modifications.** Oak Ridge Y-12 Plant, TN (United States); HSW Environmental Consultants, Inc., Oak Ridge, TN (United States). Sep 1994. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009066. Source: OSTI; NTIS; INIS; GPO Dep.

This groundwater quality report (GWQR) contains an evaluation of the groundwater quality data obtained during the 1993 calendar year (CY) at several hazardous and non-hazardous waste management facilities associated with the US DOE Y-12 Plant located on the DOE Oak Ridge Reservation (ORR) southeast of Oak Ridge, Tennessee. The groundwater quality data are presented in Part 1 of the GWQR submitted by Martin Marietta Energy Systems, Inc. to the Tennessee Department of Environment and Conservation (TDEC) in February 1994. Groundwater quality data evaluated in this report were obtained at several hazardous and non-hazardous waste management sites located within the Chestnut Ridge Hydrogeologic Regime (Chestnut Ridge Regime). The Chestnut Ridge Regime encompasses a section of Chestnut Ridge south of the Y-12 Plant and is one of three hydrogeologic regimes defined for the purposes of groundwater quality monitoring at the plant. The Environmental Management Department of the Y-12 Plant Health, Safety, Environment, and Accountability Organization manages the groundwater monitoring activities in each regime as part of the Y-12 Plant Groundwater Protection Program (GWPP). The annual GWQR for the Chestnut Ridge Regime is completed in two parts. Part 1 consists primarily of data appendices and serves as a reference for the groundwater quality data obtained each CY under the lead of the Y-12 Plant GWPP. Because it contains information needed to comply with Resource Conservation and Recovery Act (RCRA) interim status assessment monitoring and reporting requirements, the Part 1 GWQR is submitted to the TDEC by the RCRA reporting deadline (March 1 of the following CY). Part 2 (this report) contains an evaluation of the data with respect to regime-wide groundwater quality, presents the findings and status of ongoing hydrogeologic studies, describes changes in monitoring priorities, and presents planned modifications to the groundwater sampling and analysis activities.

15159 (Y/TS–1272) **An assessment of the radiological doses resulting from accidental uranium aerosol releases and fission product releases from a postulated criticality accident at the Oak Ridge Y-12 Plant.** Fisher, S.E.; Lenox, K.E. Oak Ridge Y-12 Plant, TN (United States). Mar 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (ORNL/TM–12782). Order Number DE95010227. Source: OSTI; NTIS; INIS; GPO Dep.

A dose assessment for two separate normalized source terms was conducted for the Oak Ridge Y-12 Plant. The first source term consisted of the noble gas and iodine fission products emanating from a postulated criticality with a magnitude of 10^{19} fissions. The second postulated source term was 1 kg of respirable highly enriched uranium. The MELCOR Accident Consequence Code System 2 (MACCS2) (beta test) computer code was used for this assessment. Both fixed weather (e.g., constant weather assumed throughout the accident) and sampled weather cases were

performed using MACCS2. The results of the analysis are summarized in terms of the effective dose equivalent as a function of distance along the downwind centerline of the plume. In addition, population doses for the workers and the public are presented. A brief code comparison between the MACCS2 and MESORAD computer codes is also presented. Modeling differences for the cloudshine and groundshine dose pathways are discussed. Finally, the dose results are summarized, and recommendations are provided that enable the reader to make quick estimates of downwind doses for different source terms that are scalable.

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Refer also to citation(s) 14916, 14917, 14918, 14939, 14940, 14941, 14944, 14947, 14951, 14952, 14953, 14954, 14958, 14959, 14960, 14963, 14978, 14980, 14985, 14986, 14987, 15002, 15018, 15022, 15033, 15052, 15078, 15080, 15098, 15106, 15110, 15117, 15119, 15121, 15127, 15136, 15143, 15145, 15146, 15159, 15598, 15601, 15669, 16258, 16259, 16407, 16554, 16576, 16589, 16631, 16658, 16659, 16660, 16702

15160 (ANL/EA/CP–84148) **Radiological accidents potentially important to human health risk in the U.S. Department of Energy waste management program.** Mueller, C. (Argonne National Lab., IL (United States)); Roglans-Ribas, J.; Folga, S.; Nabelssi, B.; Jackson, R. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–109: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008292. Source: OSTI; NTIS; INIS; GPO Dep.

Human health risks as a consequence of potential radiological releases resulting from plausible accident scenarios constitute an important consideration in the US Department of Energy (DOE) national program to manage the treatment, storage, and disposal of wastes. As part of this program, the Office of Environmental Management (EM) is currently preparing a Programmatic Environmental Impact Statement (PEIS) that evaluates the risks that could result from managing five different waste types. This paper (1) briefly reviews the overall approach used to assess process and facility accidents for the EM PEIS; (2) summarizes the key inventory, storage, and treatment characteristics of the various DOE waste types important to the selection of accidents; (3) discusses in detail the key assumptions in modeling risk-dominant accidents; and (4) relates comparative source term results and sensitivities.

15161 (ANL/EA/CP–84160) **Accident analysis for transuranic waste management alternatives in the U.S. Department of Energy waste management program.** Nabelssi, B. (Argonne National Lab., IL (United States)); Mueller, C.; Roglans-Ribas, J.; Folga, S.; Tompkins, M.; Jackson, R. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–104: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008286. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary accident analyses and radiological source term evaluations have been conducted for transuranic waste (TRUW) as part of the US Department of Energy (DOE) effort to manage storage, treatment, and disposal of radioactive wastes at its various sites. The approach to assessing radiological releases from facility accidents was developed in support of the Office of Environmental Management Programmatic Environmental Impact Statement (EM PEIS). The methodology developed in this work is in accordance with the latest DOE guidelines, which consider the spectrum of possible accident scenarios in the implementation of various actions evaluated in an EIS. The radiological releases from potential risk-dominant accidents in storage and treatment facilities considered in the EM PEIS TRUW alternatives are described in this paper. The results show that significant releases can be predicted for only the most severe and extremely improbable accidents sequences.

15162 (ANL/EA/CP–84163) **Issues related to uncertainty in projections of hazardous and mixed waste volumes in the U.S. Department of Energy's environmental restoration program.** Picel, K.C. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–107: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008289. Source: OSTI; NTIS; INIS; GPO Dep.

Projected volumes of contaminated media and debris at US Department of Energy (DOE) environmental restoration sites that are potentially subject to the hazardous waste provisions of the Resource Conservation and Recovery Act are needed to support programmatic planning. Such projections have been gathered in various surveys conducted under DOE's environmental restoration and waste management programs. It is expected that reducing uncertainty in the projections through review of existing site data and process knowledge and through further site characterization will result in substantially lowered projections. If promulgated, the US Environmental Protection Agency's Hazardous Waste Identification Rule would result in potentially even greater reductions in the projections when site conditions are reviewed under the provisions of the new rule. Reducing uncertainty in projections under current and future waste identification rules may be necessary to support effective remediation planning. Further characterization efforts that may be conducted should be designed to limit uncertainty in identifying volumes of wastes to the extent needed to support alternative selection and to minimize costs of remediation.

15163 (ANL/EA/CP–84167) **Case study: Evaluation of a scenario for the reuse of structures in the production area at Fernald.** Davis, M.J. (Argonne National Lab., IL (United States)); Folga, S.; Janke, R.J.; Kozlowski, D.R. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–99: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008279. Source: OSTI; NTIS; INIS; GPO Dep.

The potential for the reuse of uncontaminated structures at federal facilities that are being remediated should be evaluated. Although various factors often limit the viability of such reuse, it may be economically attractive to reuse selected structures. Consideration of a hypothetical reuse scenario for the US Department of Energy's Fernald, Ohio facility shows that the reuse of selected buildings that were not significantly contaminated by production activities at the site may be considerably less expensive than the construction of new ones. The cost of removal of existing buildings is a major factor influencing the relative advantages of these two options. For Fernald, no need for the facility's buildings has been identified; however, the reuse of structures may be a viable option at other facilities.

15164 (ANL/EA/CP–84360) **Progress on integrating environmental restoration data into mixed waste updates.** Tolbert-Smith, M. (USDOE, Washington, DC (United States)); MacDonell, M.; Peterson, J.; Kirkpatrick, T. Argonne National Lab., IL (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–106: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008290. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Compliance Act required the Department of Energy to compile specific information on the volumes, characteristics, and treatment plans for mixed wastes, and to provide this information to the Environmental Protection Agency and affected states. The initial format for reporting this information was developed largely on the basis of operations wastes. Although this format is acceptable for stored environmental restoration wastes, it was found to be poorly suited for reporting wastes that could be generated by future cleanup activities, many of which have not yet been well defined. Modifications to the process initially used to report restoration wastes were made to allow them to be reported in a manner that more accurately reflects uncertainties inherent in such estimates. This revised approach allowed for the smooth integration of data for restoration wastes with those compiled by the waste management team for mixed waste inventory updates.

15165 (ANL/EA/CP–85502) **An overview of the corrective action management unit and temporary unit regulations.** Green, D.R. (Argonne National Lab., IL (United States)); Corathers,

L.; Coalgate, J. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–98: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008278. Source: OSTI; NTIS; INIS; GPO Dep.

In February 1993, the US Environmental Protection Agency (EPA) promulgated the corrective action management unit (CAMU) and temporary unit (TU) regulations as 40 CFR Part 264, Subpart S. These regulations are intended to foster the selection of protective and cost-effective remedies for the restoration of sites contaminated by hazardous substances, hazardous wastes, and hazardous waste constituents by removing certain regulatory impediments to implementing those remedies, most notably those of the land disposal restrictions (LDRs). This paper provides a brief overview of the CAMU and TU regulations.

15166 (ANL/EAD/TM–41) **Derivation of residual radioactive material guidelines for uranium in soil at the Middlesex Sampling Plant Site, Middlesex, New Jersey.** Dunning, D.E. (Argonne National Lab., IL (United States). Environmental Assessment Div.). Argonne National Lab., IL (United States). Feb 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009190. Source: OSTI; NTIS; INIS; GPO Dep.

Residual radioactive material guidelines for uranium in soil were derived for the Middlesex Sampling Plant (MSP) site in Middlesex, New Jersey. This site has been designated for remedial action under the Formerly Utilized Sites Remedial Action Program (FUSRAP) of the US Department of Energy. The site became contaminated from operations conducted in support of the Manhattan Engineer District (MED) and the Atomic Energy Commission (AEC) between 1943 and 1967. Activities conducted at the site included sampling, storage, and shipment of uranium, thorium, and beryllium ores and residues. Uranium guidelines for single radioisotopes and total uranium were derived on the basis of the requirement that the 50-year committed effective dose equivalent to a hypothetical individual living or working in the immediate vicinity of the MSP site should not exceed a dose of 30 mrem/yr following remedial action for the current-use and likely future-use scenarios or a dose of 100 mrem/yr for less likely future-use scenarios. The RESRAD computer code, which implements the methodology described in the DOE manual for establishing residual radioactive material guidelines, was used in this evaluation. Four scenarios were considered for the site. These scenarios vary regarding future land use at the site, sources of water used, and sources of food consumed.

15167 (CONF-9304128–, pp. H.3-H.22) **Progress update at Weldon Spring; focus on buildings demolition.** Green, S. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Uranium and thorium were processed at the Weldon Spring site from 1957 through 1966. Operations contaminated the 44 buildings, surrounding land areas, and waste pits. The site is being cleaned up to meet the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the National Environmental Policy Act (NEPA). An important phase of the remedial action has been occurring for the past year: the decontamination and demolition of the most highly contaminated uranium and thorium processing facilities. Work involves asbestos abatement, cleanup of chemical contaminants such as PCBs, removal of radioactive product residues, and building wash down, followed by demolition. The health physics aspects of this work present some atypical challenges. These include controlling airborne emissions given physical limitations on the use of engineering controls in dilapidated buildings, the need to superimpose asbestos abatement regulations on radiological work, and management of the large volume of waste generated, including mixed waste. This paper discusses the method of accomplishing the work and operational health physics practices used to keep environmental release of radioactive material and worker exposures ALARA.

15168 (CONF-9304128–, pp. J.17-J.22) **Radiological hazard classification of DOE facilities by DOE STD-1027-92: LANL nuclear facility list.** Elder, J.C. (Los Alamos National Lab., NM (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos facilities containing significant radiological hazards have been reclassified according to DOE-STD 1027-92, a recently issued guide for hazard classification. DOE-STD 1027-92 was provided in support of DOE Order 5480.23 to identify which facilities would be governed under DOE 5480.23 requirements; these would presumably be called nuclear facilities. This new classification has affected the original list of 18 LANL nuclear facilities by increasing it to 39. It has also lowered the classification of TA-55-4, the plutonium processing facility containing highest intrinsic hazard at LANL, from the highest classification to an intermediate classification. This presentation addresses the impact of these changes in the nuclear facility list in the areas of radiological health, safety analysis documentation, and risk management.

15169 (CONF-9504131–1) **HASCAL – A system for estimating contamination and doses from incidents at worldwide nuclear facilities.** Sjoreen, A.L. (Oak Ridge National Lab., TN (United States). Computing Applications Div.); Sykes, R.I. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by Defense Nuclear Agency, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. American Nuclear Society (ANS) topical meeting on emergency preparedness and response; Aiken, SC (United States); Apr 1995. Order Number DE95008904. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazard Assessment System for Consequence Analysis (HASCAL) is being developed to support the analysis of radiological incidents anywhere in the world for the Defense Nuclear Agency (DNA). HASCAL is a component of the Hazard Prediction and Assessment Capability (HPAC), which is a comprehensive nuclear, biological, and chemical hazard effects planning and forecasting modeling system that is being developed by DNA. HASCAL computes best-guess estimates of the consequences of radiological incidents. HASCAL estimates the amount of radioactivity released, its atmospheric transport and deposition, and the resulting radiological doses.

15170 (DOE/ER–0640) **Program overview: Subsurface science program.** USDOE Office of Energy Research, Washington, DC (United States). Environmental Sciences Div. Mar 1994. 18p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010163. Source: OSTI; NTIS; INIS; GPO Dep.

The OHER Subsurface Science Program is DOE's core basic research program concerned with subsoils and groundwater. These practices have resulted in contamination by mixtures of organic chemicals, inorganic chemicals, and radionuclides. A primary long-term goal is to provide a foundation of knowledge that will lead to the reduction of environmental risks and to cost-effective cleanup strategies. Since the Program was initiated in 1985, a substantial amount of research in hydrogeology, subsurface microbiology, and the geochemistry of organically complexed radionuclides has been completed, leading to a better understanding of contaminant transport in groundwater and to new insights into microbial distribution and function in the subsurface environments. The Subsurface Science Program focuses on achieving long-term scientific advances that will assist DOE in the following key areas: providing the scientific basis for innovative in situ remediation technologies that are based on a concept of decontamination through benign manipulation of natural systems; understanding the complex mechanisms and process interactions that occur in the subsurface; determining the influence of chemical and geochemical-microbial processes on co-contaminant mobility to reduce environmental risks; improving predictions of contaminant transport that draw on fundamental knowledge of contaminant behavior in the presence of physical and chemical heterogeneities to improve cleanup effectiveness and to predict environmental risks.

15171 (DOE/HWP–130) **Literature search, review, and compilation of data for chemical and radiochemical sensors: Task 1 report.** Oak Ridge National Lab., TN (United States). HAZWRAP Support Contractor Office; Advanced Sciences, Inc., Albuquerque, NM (United States). Jan 1993. 208p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009602. Source: OSTI; NTIS; INIS; GPO Dep.

During the next several decades, the US Department of Energy is expected to spend tens of billions of dollars in the characterization, cleanup, and monitoring of DOE's current and former installations that have various degrees of soil and groundwater contamination made up of both hazardous and mixed wastes. Each of these phases will require site surveys to determine type and quantity of hazardous and mixed wastes. It is generally recognized that these required survey and monitoring efforts cannot be performed using traditional chemistry methods based on laboratory evaluation of samples from the field. For that reason, a tremendous push during the past decade or so has been made on research and development of sensors. This report contains the results of an extensive literature search on sensors that are used or have applicability in environmental and waste management. While restricting the search to a relatively small part of the total chemistry spectrum, a sizable body of reference material is included. Results are presented in tabular form for general references obtained from data base searches, as narrative reviews of relevant chapters from proceedings, as book reviews, and as reviews of journal articles with particular relevance to the review. Four broad sensor types are covered: electrochemical processes, piezoelectric devices, fiber optics, and radiochemical processes. The topics of surface chemistry processes and biosensors are not treated separately because they often are an adjunct to one of the four sensors listed. About 1,000 tabular entries are listed, including selected journal articles, reviews of conference/meeting proceedings, and books. Literature to about mid-1992 is covered.

15172 (DOE/RL–93-54-Draft-A) **Risk evaluation of remedial alternatives for the Hanford Site.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95007600. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance on the process of risk evaluation of remedial alternatives (RERA) at the Hanford Site. Remediation activities at the Hanford Site are being conducted pursuant to the Comprehensive Environmental Restoration, Compensation, and Liability Act and the Resource Conservation and Recovery Act. This document identifies points in the remedial alternative selection process where risk assessment input is either required or desirable. For each of these points of application, the document identifies issues to consider and address, and suggests possible approaches, techniques, and appropriate levels of detail. The level of detail of a RERA is driven by the need to use risk as a criterion for selecting a remedial alternative. Such a document is needed to ensure that RERA is conducted in a consistent manner, and to prevent restating or creating guidance within each RERA.

15173 (DOE/RL–94-42) **Limited field investigation report for the 100-BC-2 Operable Unit.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Nov 1994. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95009555. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the limited field investigation and presents the associated qualitative risk assessment (QRA). It provides recommendations on the continued candidacy for interim remedial measures (IRM) for the 3 high-priority waste sites and 11 solid waste burial grounds in this operable unit. Purpose of this report is to summarize the site characterization activities, refine the conceptual exposure model as needed, identify chemical- and location-specific applicable or relevant and appropriate requirements, provide a QRA of risks associated with high-priority sites and a solid waste burial ground, and identify candidate sites for remaining on the IRM path. (The 100-BC-2 Source Operable Unit consists of 1.7 km^2 (0.6 mi^2) within the 100 B/C Area; the operable unit contains waste sites associated with the original plant facilities constructed to support operation of C Reactor and liquid, sludge, and solid waste units.)

15174 (DOE/RL–94-53-Draft-A) **Limited field investigation report for the 100-HR-2 Operable Unit.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1994. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95008318. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the 100-HR-2 Operable Unit investigative phase and the associated qualitative risk assessment (QRA). The 100-HR-2 Operable Unit contains solid waste burial grounds, an ash pit, burn pits, electrical facilities, septic systems, and support facilities. All known and suspected areas of contamination were classified as solid waste burial grounds or low-priority waste sites based on the collective knowledge of the operable unit managers (representatives from the US Department of Energy [DOE], the US Environmental Protection Agency [EPA], and Washington Department of Ecology [Ecology]) during the preparation of the 100-HR-2 Operable Unit work plan (DOE/RL 1993f). Solid waste burial grounds were judged to pose sufficient risk(s), through one or more pathways, to require evaluation for an interim remedial measure (IRM) as per the Hanford Past-Practice Strategy (HPPS) (DOE/RL 1991) and negotiations with DOE, EPA, and Ecology. An IRM is intended to achieve remedies that are likely to lead to a final record of decision. Low-priority sites are those judged not to pose significant risk to require the streamlined evaluation. There were six low-priority waste sites and seven solid waste burial grounds identified. The investigative phase was conducted in accordance with the RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-2 Operable Unit (DOE/RL 1993f). The QRA was performed in accordance with the Hanford Site Baseline Risk Assessment Methodology (DOE/RL 1993b) and the recommendations incorporate the strategies of the HPPS. The purpose of this report is to: (1) provide a summary of site investigative activities; (2) refine the conceptual exposure model (as needed); (3) identify chemical- and location-specific corrective action requirements; and (4) provide a human health and ecological QRA associated with solid waste burial grounds.

15175 (FEMP–2359) **Strategy utilized for assessing baseline risks to human health from K-65 and metal oxide residues stored at the Fernald Site.** Harmon, J.E. (FERMCO, Cincinnati, OH (United States). Fernald Environmental Management Project); Janke, R.C. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–91: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009016. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) is responsible for cleanup activities at the Fernald Environmental Management Project (FEMP) site in southwestern Ohio. The 425-hectare site consists of a former 55-hectare Production Area, an adjacent Waste Storage Area and various support facilities. From 1952 until 1989, the FEMP processed uranium into metallic "feed" materials for other DOE facilities in the nation's defense program. In accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the FEMP site is currently listed on the National Priorities List (NPL). To facilitate an expeditious cleanup effort, environmental issues associated with site cleanup are being managed under five operable units. This paper summarizes the risk assessment strategy employed to determine baseline human health risks associated with K-65 and metal oxide residues currently stored in Operable Unit 4. The K-65 and metal oxide residues were generated during the 1950s as a result of the extraction of uranium from uranium-bearing ores and concentrates. These residues are currently stored within Operable Unit 4 in concrete silos. Silos 1 and 2 contain approximately 6,120 cubic meters [m^3] (8,005 cubic yards [yd^3]) of K-65 residues, while silos 3 contains approximately 3890 m^3 (5,080 yd^3) of cold metal oxides. These concrete silos are

beyond their design life and require remedial action. The risk assessment conducted for Operable Unit 4 constitutes the first detailed human health risk assessment to be approved by the Environmental Protection Agency (EPA) for the CERCLA clean-up effort at the FEMP Site. This paper discusses the FEMP's use of a Risk Information Quality Objective process in concert with the traditional risk assessment approach to determine baseline risk to human health and the environment posed by Operable Unit 4. A summary of the baseline risks to human health is also presented.

15176 (FEMP–2367) **Waste minimization applications at a remediation site.** Allmon, L.A. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 23 Jan 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950216–94: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009025. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP) owned by the Department of Energy was used for the processing of uranium. In 1989 Fernald suspended production of uranium metals and was placed on the National Priorities List (NPL). The site's mission has changed from one of production to environmental restoration. Many groups necessary for producing a product were deemed irrelevant for remediation work, including Waste Minimization. Waste Minimization does not readily appear to be applicable to remediation work. Environmental remediation is designed to correct adverse impacts to the environment from past operations and generates significant amounts of waste requiring management. The premise of pollution prevention is to avoid waste generation, thus remediation is in direct conflict with this premise. Although greater amounts of waste will be generated during environmental remediation, treatment capacities are not always available and disposal is becoming more difficult and costly. This creates the need for pollution prevention and waste minimization. Applying waste minimization principles at a remediation site is an enormous challenge. If the remediation site is also radiologically contaminated it is even a bigger challenge. Innovative techniques and ideas must be utilized to achieve reductions in the amount of waste that must be managed or dispositioned. At Fernald the waste minimization paradigm was shifted from focusing efforts on source reduction to focusing efforts on recycle/reuse by inverting the EPA waste management hierarchy. A fundamental difference at remediation sites is that source reduction has limited applicability to legacy wastes but can be applied successfully on secondary waste generation. The bulk of measurable waste reduction will be achieved by the recycle/reuse of primary wastes and by segregation and decontamination of secondary wastestreams. Each effort must be measured in terms of being economically and ecologically beneficial.

15177 (INEL–94/0005-Rev.1) **Hazard classification for the supercritical water oxidation test bed. Revision 1.** Ramos, A.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (EGG-WTD–11316). Order Number DE95008618. Source: OSTI; NTIS; INIS; GPO Dep.

A hazard classification of "routinely accepted by the public" has been determined for the operation of the supercritical water oxidation test bed at the Idaho National Engineering Laboratory. This determination is based on the fact that the design and proposed operation meet or exceed appropriate national standards so that the risks are equivalent to those present in similar activities conducted in private industry. Each of the 17 criteria for hazards "routinely accepted by the public," identified in the EG and G Idaho, Inc., Safety Manual, were analyzed. The supercritical water oxidation (SCWO) test bed will treat simulated mixed waste without the radioactive component. It will be designed to operate with eight test wastes. These test wastes have been chosen to represent a broad cross-section of candidate mixed wastes anticipated for storage or generation by DOE. In particular, the test bed will generate data to evaluate the ability of the technology to treat chlorinated waste and other wastes that have in the past caused severe corrosion and deposition in SCWO reactors.

15178 (ORNL–6844) **Level 3 baseline risk evaluation for Building 3506 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Golden, K.M.; Robers, S.K.; Cretella, F.M. Oak Ridge National Lab., TN (United States). Dec 1994. 356p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008965. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Level 3 Baseline Risk Evaluation (BRE) performed on Building 3506 located at the Oak Ridge National Laboratory (ORNL). This BRE is intended to provide an analysis of the potential for adverse health effects (current or future) posed by contaminants at the facility. The decision was made to conduct a Level 3 (least rigorous) BRE because only residual contamination exists in the building. Future plans for the facility (demolition) also preclude a rigorous analysis. Site characterization activities for Building 3506 were conducted in fall of 1993. Concrete core samples were taken from the floors and walls of both the cell and the east gallery. These cores were analyzed for radionuclides and organic and inorganic chemicals. Smear samples and direct radiation measurements were also collected. Sediment exists on the floor of the cell and was also analyzed. To adequately characterize the risks posed by the facility, receptors for both current and potential future land uses were evaluated. For the current land use conditions, two receptors were evaluated. The first receptor is a hypothetical maintenance worker who spends 250 days (8 hours/day) for 25 years working in the facility. The remaining receptor evaluated is a hypothetical S and M worker who spends 2 days (8 hours/day) per year for 25 years working within the facility. This particular receptor best exemplifies the current worker scenario for the facility. The two current exposure scenarios and parameters of exposure (e.g., inhalation and ingestion rates) have been developed to provide a conservative (i.e. health protective) estimate of potential exposure.

15179 (ORNL/TM–12911) **Decontamination of surfaces by blasting with crystals of H_2O and CO_2.** Benson, C.E.; Parfitt, J.E.; Patton, B.D. Oak Ridge National Lab., TN (United States). Feb 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009183. Source: OSTI; NTIS; INIS; GPO Dep.

A major mission of the US Department of Energy during the 1990s is site and environmental cleanup. In pursuit of this mission, numerous remediation projects are under way and many others are being planned at Oak Ridge National Laboratory (ORNL). In this report, tests using two proposed methods for decontaminating surfaces one using water ice crystals [Crystalline Ice Blast (CIB)], the other using dry ice crystals (CO_2 Cleanblast™) – are described. Both methods are adaptations of the commonly used sand blasting technology. The two methods tested differ from sand blasting in that the particles are not particularly abrasive and do not accumulate as particles in the wastes. They differ from each other in that the CO_2 particles sublime during and after impact and the ice particles melt. Thus, the two demonstrations provide important information about two strong candidate decontamination methodologies. Each process was tested at ORNL using contaminated lead bricks and contaminated tools and equipment. Demonstrations with the prototype Crystalline Ice Blast and the CO_2 Cleanblast systems showed that paint, grease, and oil can be removed from metal, plastic, asphalt, and concrete surfaces. Furthermore, removal of contamination from lead bricks was highly effective. Both processes were found to be less effective, under the conditions tested, with contaminated tools and equipment that had chemically bonded contamination or contamination located in crevices since neither technology abrades the substrates or penetrates deeply into crevices to remove particulates. Some process improvements are recommended.

15180 (PNL–10422) **Geology, hydrology, chemistry, and microbiology of the in situ bioremediation demonstration site.** Newcomer, D.R.; Doremus, L.A.; Hall, S.H.; Truex, M.J.; Vermeul, V.R.; Engelman, R.E. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95008896. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes characterization information on the geology, hydrology, microbiology, contaminant distribution, and

ground-water chemistry to support demonstration of in situ bioremediation at the Hanford Site. The purpose of this information is to provide baseline conditions, including a conceptual model of the aquifer being utilized for in situ bioremediation. Data were collected from sampling and other characterization activities associated with three wells drilled in the upper part of the suprabasalt aquifer. Results of point-dilution tracer tests, conducted in the upper 9 m (30 ft) of the aquifer, showed that most ground-water flow occurs in the upper part of this zone, which is consistent with hydraulic test results and geologic and geophysical data. Other tracer test results indicated that natural ground-water flow velocity is equal to or less than about 0.03 m/d (0.1 ft/d). Laboratory hydraulic conductivity measurements, which represent the local distribution of vertical hydraulic conductivity, varied up to three orders of magnitude. Based on concentration data from both the vadose and saturated zone, it is suggested that most, if not all, of the carbon tetrachloride detected is representative of the aqueous phase. Concentrations of carbon tetrachloride, associated with a contaminant plume in the 200-West Area, ranged from approximately 500 to 3,800 μg/L in the aqueous phase and from approximately 10 to 290 μg/L in the solid phase at the demonstration site. Carbon tetrachloride gas was detected in the vadose zone, suggesting volatilization and subsequent upward migration from the saturated zone.

15181 (PNL-SA–25063) **A systematic approach for future solid waste cleanup activities at the Hanford Site.** Dirks, L.L. (Pacific Northwest Lab., Richland, WA (United States)); Konynenbelt, H.S.; Hladek, K.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216–83: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008958. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the systematic approach to the treatment, storage, and disposal system (TSD) planning and management that has been developed and implemented by Hanford's Solid Waste Program. The systematic approach includes: collecting the forecast and waste inventory data; defining Hanford's TSD system; studying and refining the TSD system by using analysis tools; and documenting analysis results. The customers responsible for planning, funding, and managing future solid waste activities have driven the evolution of the solid waste system. Currently, all treatment facilities are several years from operating. As these facilities become closer to reality, more detailed systems analysis and modeling will be necessary to successfully remediate solid waste at the Site. The tools will continue to be developed in detail to address the complexities of the system as they become better defined. The tools will help determine which facility lay-outs are most optimal, will help determine what types of equipment should be used to optimize the transport of materials to and from each TSD facility, and will be used for performing life-cycle analysis. It is envisioned that in addition to developing the tools to be adapted to the more specific facility design issues, this approach will also be used as an example for other waste installations across the DOE complex.

15182 (PNL-SA–25864) **The value of adding regional to local stakeholder involvement in evaluating the acceptability of innovative technologies.** Peterson, T.S. (Pacific Northwest Lab., Richland, WA (United States)); McCabe, G.; Niesen, K.; Serie, P. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216–116: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008937. Source: OSTI; NTIS; INIS; GPO Dep.

Technology is urgently needed to clean up contamination by volatile organic compounds at United States Department of Energy (DOE) sites. In many cases, however, existing technology is too slow, inefficient, or expensive. The record of technology development is, in some cases, similarly disappointing. Remediation technologies developed at great expense and evaluated piecemeal over long periods have not been deployed because, in the end, the public judged them ineffective or unacceptable. The need for successful methods of remediation is too great and resources too limited to continue with ineffective technology evaluation. In order to make good decisions about which technologies to deploy, remedial project managers need to know stakeholders' requirements for the performance of proposed technologies. Expanding stakeholder involvement regionally identifies the concerns of a broad range of stakeholders at and DOE sites throughout the West – issues that must be taken into account if technologies are to be accepted for wide deployment.

15183 (RFP–4939) **Potassium ferrate treatment of RFETS' contaminated groundwater.** USDOE Rocky Flats Office, Golden, CO (United States). Jan 1995. 237p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE95009019. Source: OSTI; NTIS; INIS; GPO Dep.

The potassium ferrate treatment study of Rocky Flats Environmental Technology Site (RFETS) groundwater was performed under the Sitewide Treatability Studies Program (STSP). This study was undertaken to determine the effectiveness of potassium ferrate in a water treatment system to remove the contaminants of concern (COCS) from groundwater at the RFETS. Potassium ferrate is a simple salt where the iron is in the plus six valence state. It is the iron at the plus six valence state (Fe^{+6}) that makes it an unique water treatment chemical, especially in waters where the pH is greater than seven. In basic solutions where the solubility of the oxides/hydroxides of many of the COCs is low, solids are formed as the pH is raised. By using ferrate these solids are agglomerated so they can be effectively removed by sedimentation in conventional water treatment equipment. The objective of this study was to determine the quality of water after treatment with potassium ferrate and to determine if the Colorado Water Quality Control Commission (CWQCC) discharge limits for the COCs listed in Table 1.0-1 could be met. Radionuclides in the groundwater were of special concern.

15184 (UCRL-JC–110903) **Accounting for predictive uncertainty in a risk analysis focusing on radiological contamination of groundwater.** Andricevic, R. (Desert Research Institute, Las Vegas, NV (United States)); Jacobson, R.L.; Daniels, J.I. Lawrence Livermore National Lab., CA (United States). Dec 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309481–1: International commission on groundwater of the International Association of Hydrological Science, Tallinn (Estonia), 6-9 Sep 1993). Order Number DE95009877. Source: OSTI; NTIS; INIS; GPO Dep.

This study focuses on the probabilistic travel time approach for predicting transport of radionuclides by groundwater velocity considering parameter uncertainty. The principal entity in the presented model is a travel time probability density function (pdf) conditioned on the set of parameters used to describe different transport processes like advection, dispersion, sorption, and decay. The model is applied to predict the arrival time of radionuclides in groundwater from the Nevada Test Site (NTS) at possible locations of potential human receptors nearby. Because of the lack of sorption the Tritium is found to provide the largest risk. Inclusion of sorption processes indicate that the parameter uncertainty and especially negative correlation between the mean velocity and the sorption strength is instrumental in evaluating the radionuclides arrival time at the prespecified accessible environment. Our analysis of potential health risks takes into consideration uncertainties in physiological attributes, as well as in committed effective dose and the estimate of physical detriment per unit Committed Effective Dose.

15185 (UCRL-JC–118795) **Risk from a compressed toxic gas system: Part 1, Dispersal probability.** Altenbach, T.J.; Brereton, S.J. Lawrence Livermore National Lab., CA (United States). 13 Feb 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950740–22: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95009532. Source: OSTI; NTIS; GPO Dep.

At the Lawrence Livermore National Laboratory, we have prepared a Safety Analysis Report for the Department of Energy on our Building 332 Plutonium Handling Facility. This SAR includes an analysis of potential accident scenarios which could lead to offsite consequences to the public having not only radiological exposures, but also exposures to toxic gases such as chlorine. This paper presents a risk analysis of pressurized chlorine gas system proposed for use at Building 332. The focus of the analysis is to

calculate the predicted frequency of an unmitigated leak of chlorine from the system which could result in the dispersal of the entire contents of the gas cylinder to the environment. Modeled are postulated valve leaks or pipe ruptures occurring anywhere in the distribution system, as well as the potential failure of leak mitigation. The fundamental credibility of this type of accident is established. The importance of a reliable leak mitigation system is demonstrated, and the dependence of the results on less than optimal data is discussed in the context of uncertainty and sensitivity analyses.

15186 (WHC-EP–0848) **Preliminary Hanford technical input for the Department of Energy programmatic spent nuclear fuel management and Idaho National Engineering Laboratory environmental restoration and waste management programs environmental impact statement.** Bergsman, K.H. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008792. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is currently evaluating its programmatic options for the safe management of its diverse spent nuclear fuel (SNF) inventory in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (SNF and INEL EIS). In the SNF and INEL EIS, the DOE is assessing five alternatives for SNF management, which consider at which of the DOE sites each of the various SNF types should be managed until ultimate disposition. The range of SNF inventories considered for management at the Hanford Site in the SNF and INEL EIS include the current Hanford Site inventory, only the current Hanford Site defense production SNF inventory, the DOE complex-wide SNF inventory, or none at all. Site-specific SNF management decisions will be evaluated in separate National Environmental Policy Act evaluations. Appendixes A and B include information on (1) additional facilities required to accommodate inventories of SNF within each management alternative, (2) existing and new SNF management facility descriptions, (3) facility costs for construction and operation, (4) facility workforce requirements for construction and operation, and (5) facility discharges. The information was extrapolated from existing analyses to the extent possible. New facility costs, manpower requirements, and similar information are based on rough-order-of-magnitude estimates.

15187 (WHC-SD-CP-SA–028) **Walkdown procedure: Seismic adequacy review of safety class 3 & 4 commodities in 2736-Z & ZB buildings at PFP facility.** Ocoma, E.C. Westinghouse Hanford Co., Richland, WA (United States). 29 Mar 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010143. Source: OSTI; NTIS; INIS; GPO Dep.

Seismic evaluation of existing safety class (SC) 3 and non-SC 4 commodities at the Plutonium Finishing Plant (PFP) is integrated into an area walkdown program. Field walkdowns of potential PFP seismic deficiencies associated with structural failure and falling will be performed using the DOE SQUG/EPRI methodology. Potential proximity interactions are also addressed. Objective of the walkdown is to qualify as much of the equipment as practical and to identify candidates for further evaluation.

15188 (WHC-SD-EN-TI–283) **Data quality objectives for PUREX deactivation flushing.** Bhatia, R.K. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009154. Source: OSTI; NTIS; INIS; GPO Dep.

This Data Quality Objection (DQO) defines the sampling and analysis requirements necessary to support the deactivation of the Plutonium-Uranium Extraction (PUREX) facility vessels that are regulated by WAC 173-303. Specifically, sampling and analysis requirements are identified for the flushing operations that are a major element of PUREX deactivation.

15189 (WHC-SD-GN-QAPP–001-Rev.1) **Quality assurance program plan for the Site Physical and Electrical Calibration Services Lab. Revision 1.** Carpenter, C.A. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008466. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan (QAPP) is organized to address WHC's implementation of quality assurance requirements as they are presented as interpretive guidance endorsed by the Department of Energy (DOE) Field Office, Richland DOE Order 5700.6C Quality Assurance. The quality assurance requirements presented in this plan will assure Measuring and Test Equipment (M and TE) are in conformance with prescribed technical requirements and that data provided by testing, inspection, or maintenance are valid. This QAPP covers all activities and work elements that are variously called QA, quality control, and quality engineering regardless of the organization performing the work. This QAPP identifies the QA requirements for planning, control, and documentation of operations, modifications, and maintenance of the WHC Site Physical and Electrical Calibration Services Laboratory. The primary function of the WHC Site Physical and Electrical Calibration Services Laboratory is providing calibration, standardization, or repair service of M and TE.

15190 (WHC-SD-SNF-DRR–002-Vol.2) **Design Review Report for the 105 K-East Basin dose reduction concept, Volume 2, Review Package.** Dearing, J.I. Westinghouse Hanford Co., Richland, WA (United States). 28 Mar 1995. 379p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010133. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological surveys in the 105 K-East Fuel Storage Basin show average dose rates of 4 to 50 mrem/hr. A major source of the dose is the radionuclides that have been absorbed into the concrete wall of the basin. This report documents the design review of the concept for reducing the dose from the walls. Volume 1 comprises Design Review Report and Volume 2 comprises the Design Review Package.

15191 (WHC-SD-SNF-HC–002-Rev.1) **Hazard categorization of 100K East and 100K West in-basin fuel characterization program activities. Revision 1.** Alwardt, L.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008472. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a hazard categorization of the 105 K East and 105 K West in-basin activities associated with the fuel sampling and transport preparations. It is limited to those characterization activities performed in the 105 KE and 105 KW fuel storage basin structures. The methodology of DOE standard DOE-STD-10227-92 is used. The report documents the determination that the in-basin activities associated with the fuel characterization program are classified as Hazard Category 3 (hazard analysis shows the potential for only significant localized consequences).

15192 (WHC-SD-WM-AP–005-Rev.5) **Single-shell tank leak emergency pumping guide. Revision 5.** Wiggins, D.D. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95005626. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides general information on all Single-Shell Tank Farms about readiness and special concerns for Emergency Pumping and identifies the required actions when a Single-Shell tank is identified as a leaking tank. Tank Transfer Routes are described, possible heat trace circuits are outlined, and tank riser status and obstructions are documented. Locations of existing saltwell systems and spares, information on emergency pumping equipment, watch list tank status, and transfer line integrity assessments are all included. A matrix of required actions to emergency pump individual tanks, and lists of useful drawings, procedures, work procedure outlines, and references are also provided.

15193 (WHC-SD-WM-ATR–112) **Acceptance test report for the Westinghouse 100 ton hydraulic trailer.** Barrett, R.A. Westinghouse Hanford Co., Richland, WA (United States). 6 Mar 1995.

108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008807. Source: OSTI; NTIS; INIS; GPO Dep.

The SY-101 Equipment Removal System 100 Ton Hydraulic Trailer was designed and built by KAMP Systems, Inc. Performance of the Acceptance Test Procedure at KAMP's facility in Ontario, California (termed Phase 1 in this report) was interrupted by discrepancies noted with the main hydraulic cylinder. The main cylinder was removed and sent to REMCO for repair while the trailer was sent to Lampson's facility in Pasco, Washington. The Acceptance Test Procedure was modified and performance resumed at Lampson (termed Phase 2 in this report) after receipt of the repaired cylinder. At the successful conclusion of Phase 2 testing the trailer was accepted as meeting all the performance criteria specified.

15194 (WHC-SD-WM-CMD–001) **Closed out Tank 241-SY-101 DACS system change request #1–100.** Gauck, G.J. Westinghouse Hanford Co., Richland, WA (United States). 7 Mar 1995. 167p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008885. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a compilation of system change requests processed during the development of the Data Acquisition and Control System for the Tank 241-SY-101 hydrogen mitigation project. Tank 241-SY-101 is on the Hydrogen Watch List. The disposition of the request, date the change was installed, date verified, and whether an Acceptance Test Procedure was required and completed are described for each request change.

15195 (WHC-SD-WM-HC–014) **Electrical classification for the single shell flammable gas watch list tanks.** Huckfeldt, R.A.; Anderson, R.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010060. Source: OSTI; NTIS; INIS; GPO Dep.

This document is to establish the hazard classification of single shell watch list tanks according to National Fire Protection Association (NFPA) criteria and sound engineering judgment. Establishing the hazard classification is necessary to determine the appropriate wiring methods and installation of electrical and mechanical equipment assure safety in an atmosphere that may be hazardous. The tanks have been placed on the flammable gas watch list because their waste types are similar to those in tanks that exhibit episodic behavior and/or unexplained growth of the waste-level height occuring over time. They contain mostly solid wastes.

15196 (WHC-SD-WM-TA–161) **Analytical services contract reform alternatives project.** Hunt, J.W.; Fox, M.R.; Kristofzski, J.G.; Minette, M.J. Westinghouse Hanford Co., Richland, WA (United States). 23 Mar 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010063. Source: OSTI; NTIS; GPO Dep.

Westinghouse Hanford Company (WHC) was directed by the U.S. Department of Energy, Richland Operations Office (DOE-RL) to examine the feasibility of outsourcing all or part of its laboratory and analytical functions as part of a contract reform effort. The analytical services provided by WHC were found to be significantly greater than that of a typical environmental laboratory which provides sample analysis based on a simple sample in-report out model. In addition to high-volume production analysis, the work scope includes special analytical services, technical consulting, sample handling and disposition, and special material preparations. Numerous broad ranging potential contract reform alternatives were identified and categorized into seven main alternatives with associated sub-alternatives. Issues associated with each alternative varied significantly depending on the alternative. Fifteen issues were identified and described including human resources, contract, and procurement areas. Readers of this report will perhaps identify additional alternatives and/or issues. In addressing the issues, it was determined that those issues pertaining to labor relations and procurement require major policy resolutions by WHC/DOE senior management prior to being able to establish meaningful assumptions for cost/benefit analyses of the seven alternatives. Further review was therefore stopped without economic analyses or recommendation for any specific alternative. Accordingly, this report is intended to fulfill the requirements of RL Milestone AS-95-016.

15197 (WHC-SP–0849) **Vegetation management 1994 fiscal year end report.** Rodriguez, J.M. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008791. Source: OSTI; NTIS; INIS; GPO Dep.

This year-end report evaluates vegetation management operations on the Hanford reservation conducted during fiscal year (FY) 1994 and proposed control methods to be used in FY 1995 and following years. The 1995 control methods proposed are based on an evaluation of past and current ALARA principles, employee safety, environmental impacts, applicable regulations, site esthetics, and other site-specific factors.

15198 (Y/EN–5289/V1) **Final report from VFL technologies for the pilot-scale thermal treatment of Lower East Fork Poplar Creek floodplain soils: LEFPC appendices, volume 1, appendix I-IV.** Oak Ridge National Lab., TN (United States). Sep 1994. 154p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009047. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains Appendix I-IV for the pilot-scale thermal treatment of lower East Fork Poplar Creek floodplain soils. Included are calibration records; quality assurance; soils characterization; pilot scale trial runs.

15199 (Y/EN–5289/V3) **Final report from VFL Technologies for the pilot-scale thermal treatment of Lower East Fork Poplar Creek floodplain soils. LEFPC Appendices, Volume 3, Appendix V-B.** Oak Ridge Y-12 Plant, TN (United States); VFL Technology Corp., Malvern, PA (United States). Sep 1994. 534p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009195. Source: OSTI; NTIS; INIS; GPO Dep.

This report consists of appendix V-B which contains the final verification run data package. Validation of analytical data is presented for Ecotek LSI. Analytical results are included of both soil and creek bed samples for the following contaminants: metals; metals (TCLP); uranium; gross alpha/beta; and polychlorinated biphenyls.

15200 (Y/ER–159/V1) **Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4. Volume 1: Technology evaluation.** Oak Ridge National Lab., TN (United States). Sep 1994. 260p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009067. Source: OSTI; NTIS; INIS; GPO Dep.

During World War 11, the Oak Ridge Y-12 Plant was built as part of the Manhattan Project to supply enriched uranium for weapons production. In 1945, Building 9201-4 (Alpha-4) was originally used to house a uranium isotope separation process based on electromagnetic separation technology. With the startup of the Oak Ridge K-25 Site gaseous diffusion plant In 1947, Alpha-4 was placed on standby. In 1953, the uranium enrichment process was removed, and installation of equipment for the Colex process began. The Colex process–which uses a mercury solvent and lithium hydroxide as the lithium feed material-was shut down in 1962 and drained of process materials. Residual Quantities of mercury and lithium hydroxide have remained in the process equipment. Alpha-4 contains more than one-half million ft^2 of floor area; 15,000 tons of process and electrical equipment; and 23,000 tons of insulation, mortar, brick, flooring, handrails, ducts, utilities, burnables, and sludge. Because much of this equipment and construction material is contaminated with elemental mercury, cleanup is necessary. The goal of the Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 is to provide a planning document that relates decontamination and decommissioning and waste management problems at the Alpha-4 building to the technologies that can be used to remediate these problems. The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 builds on the methodology transferred by the U.S. Air Force to the Environmental Management organization with DOE and draws from previous technology logic diagram-efforts: logic diagrams for Hanford, the K-25 Site, and ORNL.

15201 (Y/ER–159/V2) **Y-12 Plant decontamination and decommissioning technology logic diagram for Building 9201-4. Volume 2: Technology logic diagram.** Oak Ridge K-25 Site, TN (United States). Sep 1994. 383p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009196. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 (TLD) was developed to provide a decision-support tool that relates decontamination and decommissioning (D and D) problems at Bldg. 9201-4 to potential technologies that can remediate these problems. This TLD identifies the research, development, demonstration, testing, and evaluation needed for sufficient development of these technologies to allow for technology transfer and application to D and D and waste management (WM) activities. It is essential that follow-on engineering studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in the TLD and by finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk. The TLD consists of three fundamentally separate volumes: Vol. 1 (Technology Evaluation), Vol. 2 (Technology Logic Diagram), and Vol. 3 (Technology Evaluation Data Sheets). Volume 2 contains the logic linkages among environmental management goals, environmental problems, and the various technologies that have the potential to solve these problems. Volume 2 has been divided into five sections: Characterization, Decontamination, Dismantlement, Robotics/Automation, and Waste Management. Each section contains logical breakdowns of the Y-12 D and D problems by subject area and identifies technologies that can be reasonably applied to each D and D challenge.

15202 (Y/ER–159/V3/Pt.A) **Y-12 Plant decontamination and decommissioning technology logic diagram for Building 9201-4. Volume 3: Technology evaluation data sheets; Part A: Characterization, dismantlement.** Oak Ridge K-25 Site, TN (United States). Sep 1994. 412p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009068. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 (TLD) was developed to provide a decision-support tool that relates decontamination and decommissioning (D and D) problems at Bldg. 9201-4 to potential technologies that can remediate these problems. The TLD uses information from the Strategic Roadmap for the Oak Ridge Reservation, the Oak Ridge K-25 Site Technology Logic Diagram, the Oak Ridge National Laboratory Technology Logic Diagram, and a previous Hanford logic diagram. This TLD identifies the research, development, demonstration, testing, and evaluation needed for sufficient development of these technologies to allow for technology transfer and application to D and D and waste management (WM) activities. It is essential that follow-on engineering studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in the TLD and by finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk. This report consists of the characterization and dismantlement data sheets.

15203 (Y/ER–159/V3/Pt.B) **Y-12 Plant decontamination and decommissioning technology logic diagram for Building 9201-4. Volume 3: Technology evaluation data sheets; Part B: Decontamination, robotics/automation, waste management.** Oak Ridge K-25 Site, TN (United States). Sep 1994. 404p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009069. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 Plant Decontamination and Decommissioning Technology Logic Diagram for Building 9201-4 (TLD) was developed to provide a decision-support tool that relates decontamination and decommissioning (D and D) problems at Bldg. 9201-4 to potential technologies that can remediate these problems. The TLD uses information from the Strategic Roadmap for the Oak Ridge Reservation, the Oak Ridge K-25 Site Technology Logic Diagram, the Oak Ridge National Laboratory Technology Logic Diagram, and a previous Hanford logic diagram. This TLD identifies the research, development, demonstration, testing, and evaluation needed for sufficient development of these technologies to allow for technology transfer and application to D and D and waste management (WM) activities. It is essential that follow-on engineering studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in the TLD and by finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk. This report consists of the decontamination, robotics/automation, and WM data sheets.

15204 (Y/ER–210) **Decision document for performing a long-term pumping test at the S-3 Site, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Feb 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009197. Source: OSTI; NTIS; INIS; GPO Dep.

One of the principal problems confronting the remediation of Bear Creek Valley is the cleanup of contaminated groundwater. The S-3 Site is one of the locations in the valley where groundwater is most contaminated, and contamination from the S-3 Site has also caused extensive contamination of downgradient groundwater. This groundwater plume, therefore, has a high priority in the Bear Creek Valley remedial process. Pumping and treating groundwater was identified early in the feasibility study as a likely remedial alternative for the S-3 Site groundwater plume. The hydrology and geochemistry of the plume are extremely complex. There is a high degree of uncertainty in the current understanding of how the aquifer will react physically and chemically to pumping, making evaluation of a pump-and-treat alternative impractical at the present time. Before a pump-and-treat alternative can be evaluated, its technical practicability, effectiveness, and projected cost must be determined. A long-term pumping test (LTPT) at the S-3 Site has been proposed so that the information necessary to carry out this evaluation can be collected. This document constitutes the first phase in the planning process for this test.

15205 (Y/ER/SUB–91-ALV96/6-Rev.2) **Post-closure permit application for the Upper East Fork Poplar Creek hydrogeologic regime at the Y-12 Plant: New Hope Pond and Eastern S-3 ponds plume. Revision 2.** Oak Ridge Y-12 Plant, TN (United States); Geraghty and Miller, Inc., Oak Ridge, TN (United States). Feb 1995. 427p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009519. Source: OSTI; NTIS; INIS; GPO Dep.

The intent of this Post-Closure, Permit Application (PCPA) is to satisfy the post-closure permitting requirements of the Tennessee Department of Environment and Conservation (TDEC) Rule 1200-1-11. This application is for the entire Upper East Fork Poplar Creek Hydrogeologic Regime (East Fork Regime), which is within the Bear Creek Valley (BCV). This PCPA has been prepared to include the entire East Fork Regime because, although there are numerous contaminant sources within the regime, the contaminant plumes throughout the East Fork Regime have coalesced and can no longer be distinguished as separate plumes. This PCPA focuses on two recognized Resource Conservation and Recovery Act (RCRA) interim status units: New Hope Pond (NHP) and the eastern S-3 Ponds plume. This PCPA presents data from groundwater assessment monitoring throughout the regime, performed since 1986. Using this data, this PCPA demonstrates that NHP is not a statistically discernible source of groundwater contaminants and that sites upgradient of NHP are the likely sources of groundwater contamination seen in the NHP vicinity. As such, this PCPA proposes a detection monitoring program to replace the current assessment monitoring program for NHP.

15206 (Y/SUB–94-99069C(Y13)/2) **Fiscal Year 1993 Well Plugging and Abandonment Program Summary Report Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Sep 1994. 459p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009187. Source: OSTI; NTIS; GPO Dep.

This report is a synopsis of the progress of the well plugging and abandonment program at the Y-12 Plant, Oak Ridge, Tennessee, from October 1993 through August 1994. A total of 57 wells and borings were plugged and abandoned during the period of time

covered in this report. All wells and borings were plugged and abandoned in accordance with the Monitoring Well Plugging and Abandonment Plan for the U.S. Department of Energy, Y-12 Plant, Oak Ridge, Tennessee.

0550 Safeguards, Inspection, and Accountability

Refer also to citation(s) 14914, 14920, 14937, 15009, 15049, 15388, 16176, 16259, 16434

15207 (AEC–95010509) **Oak Ridge Operations nuclear materials management program handbook.** USAEC Oak Ridge Operations Office, TN (United States). Aug 1974. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010509. Source: OSTI; NTIS; GPO Dep.

Purpose of this handbook is to provide guidance for management of nuclear materials under the jurisdiction of the Oak Ridge Operations Office. Provisions of this handbook and amplifying instructions by the OR Materials Management Division apply to all OR license-exempt contractors who possess nuclear materials and to licensed contractors processing Government-furnished material. Materials covered are U-233, uranium (depleted, normal, enriched in U-235), plutonium, Pu-238, tritium, deuterium, and boron-10.

15208 (LA–12918-MS) **The safeguards options study.** Hakkila, E.A. (Los Alamos National Lab., NM (United States)); Mullen, M.F.; Olinger, C.T.; Stanbro, W.D.; Olsen, A.P.; Roche, C.T.; Rudolph, R.R.; Bieber, A.M.; Lemley, J.; Filby, E. Los Alamos National Lab., NM (United States). Apr 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009023. Source: OSTI; NTIS; INIS; GPO Dep.

The Safeguards Options Study was initiated to aid the International Safeguards Division (ISD) of the DOE Office of Arms Control and Nonproliferation in developing its programs in enhanced international safeguards. The goal was to provide a technical basis for the ISD program in this area. The Safeguards Options Study has been a cooperative effort among ten organizations. These are Argonne National Laboratory, Brookhaven National Laboratory, Idaho National Engineering Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Mound Laboratory, Oak Ridge National Laboratory, Pacific Northwest Laboratories, Sandia National Laboratories, and Special Technologies Laboratory. Much of the Motivation for the Safeguards Options Study is the recognition after the Iraq experience that there are deficiencies in the present approach to international safeguards. While under International Atomic Energy Agency (IAEA) safeguards at their declared facilities, Iraq was able to develop a significant weapons program without being noticed. This is because negotiated safeguards only applied at declared sites. Even so, their nuclear weapons program clearly conflicted with Iraq's obligations under the Nuclear Nonproliferation Treaty (NPT) as a nonnuclear weapon state.

15209 (LA–12935-MS) **Proliferation resistance criteria for fissile material disposition.** Close, D.A. (Los Alamos National Lab., NM (United States)); Fearey, B.L.; Markin, J.T.; Rutherford, D.A.; Duggan, R.A.; Jaeger, C.D.; Mangan, D.L.; Moya, R.W.; Moore, L.R.; Strait, R.S. Los Alamos National Lab., NM (United States). Apr 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009021. Source: OSTI; NTIS; INIS; GPO Dep.

The 1994 National Academy of Sciences study "Management and Disposition of Excess Weapons Plutonium" defined options for reducing the national and international proliferation risks of materials declared excess to the nuclear weapons program. This report proposes criteria for assessing the proliferation resistance of these options. The criteria are general, encompassing all stages of the disposition process from storage through intermediate processing to final disposition including the facilities, processing technologies and materials, the level of safeguards for these materials, and the national/subnational threat to the materials.

15210 (LA-UR–95-1039) **Misuse and intrusion detection at Los Alamos National Laboratory.** Jackson, K.A.; Neuman, M.C.; Simmonds, D.D.; Stallings, C.A.; Thompson, J.L.; Christoph, G.G. Los Alamos National Lab., NM (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505191–1: 17. Department of Energy computer security group training conference, Milwaukee, WI (United States), 1-4 May 1995). Order Number DE95009413. Source: OSTI; NTIS; GPO Dep.

An effective method for detecting computer misuse is the automatic auditing and analysis of on-line user activity. This activity is reflected in system audit records, in system vulnerability postures, and in other evidence found through active system testing. Since 1989 we have implemented a misuse and intrusion detection system at Los Alamos. This is the Network Anomaly Detection and Intrusion Reporter, or NADIR. NADIR currently audits a Kerberos distributed authentication system, file activity on a mass, storage system, and four Cray supercomputers that run the UNICOS operating system. NADIR summarizes user activity and system configuration in statistical profiles. It compares these profiles to expert rules that define security policy and improper or suspicious behavior. It reports suspicious behavior to security auditors and provides tools to aid in follow-up investigations, As NADIR is constantly evolving, this paper reports its development to date.

15211 (NUREG–0430-Vol.14) **Licensed fuel facility. Volume 14. Inventory difference data, status report, July 1, 1993–June 30, 1994.** Joy, D.R. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Material Safety and Safeguards. Mar 1995. 14p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

The Nuclear Regulatory Commission is committed to an annual publication of licensed fuel facilities' inventory difference (ID) results, after Agency review of the information and completion of any related investigations. Information in this report includes ID results for active fuel fabrication and/or recovery facilities.

15212 (UCRL-ID–119816) **A human engineering and ergonomic evaluation of the security access panel interface.** Hartney, C.; Banks, W.W. Lawrence Livermore National Lab., CA (United States). Feb 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010210. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study was to empirically determine which of several security hardware interface designs produced the highest levels of end-user performance and acceptance. The FESSP Security Alarms and Monitoring Systems program area commissioned the authors study as decision support for upgrading the Argus security system's primary user interface so that Argus equipment will support the new DOE and DoD security access badges. Twenty-two test subjects were repeatedly tested using six remote access panel (RAP) designs. Lawrence Livermore National Laboratory (LLNL) uses one of these interface designs in its security access booths. Along with the RAP B insert-style reader, the authors tested five prototype RAP variants, each with a different style of swipe badge reader, through which a badge is moved or swiped. The authors asked the untrained test subjects to use each RAP while they described how they thought they should respond so that the system would operate correctly in reading the magnetic strip on a security badge. With each RAP variant, subjects were required to make four successful card reads (swipes) in which the card reader correctly read and logged the transaction. After each trial, a subject completed a 10-item interface acceptance evaluation before approaching the next RAP. After interacting with the RAP interfaces (for a total of the six RAP trials), each subject completed a 7-item overview evaluation that compared and ranked the five experimental RAPs, using the original (RAP B) insert style as a standard.

15213 (Y/DW–1351) **A Continuous Automated Vault Inventory System (CAVIS) for accountability monitoring of stored nuclear materials.** Pickett, C.A. (and others); Barham, M.A.; Gafford, T.A.; Hutchinson, D.P.; Jordan, J.K.; Maxey, L.C.; Moran, B.W.; Muhs, J.; Nodine, R.; Simpson, M.L. Oak Ridge National Lab., TN (United States). 8 Dec 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009051. Source: OSTI; NTIS; INIS; GPO Dep.

Nearly all facilities that store hazardous (radioactive or nonradioactive) materials must comply with prevailing federal, state,

and local laws. These laws usually have components that require periodic physical inspections to insure that all materials remain safely and securely stored. The inspections are generally labor intensive, slow, put personnel at risk, and only find anomalies after they have occurred. The system described in this paper was developed for monitoring stored nuclear materials resulting from weapons dismantlement, but its applications extend to any storage facility that meets the above criteria. The traditional special nuclear material (SNM) accountability programs, that are currently used within most of the Department of Energy (DOE) complex, require the physical entry of highly trained personnel into SNM storage vaults. This imposes the need for additional security measures, which typically mandate that extra security personnel be present while SNM inventories are performed. These requirements increase labor costs and put additional personnel at risk to radiation exposure. In some cases, individuals have received radiation exposure equivalent to the annual maximum during just one inventory verification. With increasing overhead costs, the current system is rapidly becoming too expensive to operate, the need for an automated method of inventory verification is evident. The Continuous Automated Vault Inventory System (CAVIS) described in this paper was designed and prototyped as a low cost, highly reliable, and user friendly system that is capable of providing, real-time weight, gamma. and neutron energy confirmation from each item stored in a SNM vault. This paper describes the sensor technologies, the CAVIS prototype system (built at Y- 12 for highly enriched uranium storage), the technical requirements that must be achieved to assure successful implementation, and descriptions of sensor technologies needed for a plutonium facility.

0560 Legislation and Regulations

Refer also to citation(s) 15001, 15102, 15168, 15456, 15646

15214 (ECE/ENVWA–32(add.1)) **Bilateral and multilateral agreements and other arrangements in Europe and North America on the protection and use of transboundary waters. Addendum. 1994 Update.** United Nations Economic Commission for Europe (ECE), Geneva (Switzerland). 23 Jan 1995. 10p. Order Number DE95628138. Source: OSTI; NTIS (US Sales Only); INIS.

The present document is issued pursuant to the decision taken by the Committee on Environmental Policy at its first session (ECE/CEP/1) to revise and update annually the 1993 list of Bilateral and Multilateral Agreements and Other Arrangements in Europe and North America on the Protection and Use of Transboundary Waters (ECE/ENVWA/32) and to publish a completely revised and updated version of the consolidated list of agreements at three-yearly intervals. By 31 December 1994, additions and amendments to this document had been submitted by the delegations of Austria, Croatia, Netherlands, Russian Federation and Slovakia. These have been incorporated into the present document.

15215 (INIS-mf–14508) **Radiation protection code of practice.** Ministry of Energy and Mineral Resources, Amman (Jordan). 1995. 110p. (In Arabic). Order Number DE95628139. Source: OSTI; NTIS (US Sales Only); INIS.

A collection of legal and regulatory material governing Jordan's radiation protection activities. The full text of Jordan's Nuclear Energy and Radiation Protection Law (No. 14 for 1987) is given, along with relevant regulations which are enforced in Jordan. The regulations cover the areas of shielding radiology rooms, defining radiation work, decontamination in the event of laboratory scale radiological accidents, radioactive waste disposal, personnel dosimetry, assigning radiation protection officers, licensing, and inspection. (A.M.H.). 12 tabs., 6 figs.

15216 (NEI-DK–1901) **Statement concerning the transport of radioactive materials during the year 1994.** Statens Inst. for Straalehygiejne, Broenshoej (Denmark). Jan 1995. 23p. (In Danish). Order Number DE95628853. Source: OSTI; NTIS; INIS.

An account of the use and transport of radioactive materials in Denmark and of the relevant regulations insofar as there have been changes in connection with those mentioned in the similar statement published for 1993. During 1994, after an interval of six years, Risoe National Laboratory has arranged for the transport of spent nuclear fuels from the research reactor designated DR3 to USA. This transportation and transportations from three other European research reactors by ships registered in Denmark are described in some detail. Inspection and control, especially with regard to the transport to USA of spent reactor fuels from DR3, international and national cooperation in this field, the European Union, the International Atomic Energy Agency (IAEA), the Nordic transport group and the Danish contact committee are dealt with in addition to the extent of transport of radioactive materials, and connected accidents and radiation doses. (AB).

15217 (PNRI-F(SI)–91001) **Safety regulations of radiation sources in industry in the Philippines.** Borras, A.M. (Licensing and Evaluation Section, Nuclear Regulations Licensing and Safeguards Division, Philippine Nuclear Research Institute, Diliman, Quezon City (Philippines)). Philippine Nuclear Research Inst., Diliman, Quezon City (Philippines). 1991. [16p.] Order Number DE95627091. Source: OSTI; NTIS (US Sales Only); INIS.

Country report presented at the Regional (RCA) Training Course on Safety Aspects in the Industrial Applications of Radiation Sources, Bombay, India, 2-13 December 1991.

The Philippine Nuclear Research Institute (PNRI) by virtue of Republic Act 2067, as amended, Republic Act 5207 and Executive Order 128 (1987), was mandated to advance and regulate the safe and peaceful applications of nuclear science and technology in the Philippines. The PNRI was formerly the Philippine Atomic Energy Commission established in 1958. This report aims to share the experiences of the PNRI on licensing and regulating the safe use of radioactive materials in industry, particularly in industrial gamma radiography, nuclear gauges and radioactive tracers. It enumerates the licensing and enforcement procedures. Some common problems encountered in the licensing and enforcement activities and comments of future plans to resolve the problems were also discussed. (Author).

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

15218 (JINR–18-92-260) **Production of medical radioisotopes using JINR accelerators. Possibilities and prospects.** Dmitriev, S.N.; Zajtseva, N.G.; Oganesyan, R.Ts.; Gul'bekyan, G.G.; Onishchenko, L.M.; Khalkin, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 14p. (In Russian). Order Number DE95626738. Source: OSTI; NTIS (US Sales Only); INIS.

Prospects of using the JINR accelerators - the micrrotron MT-25, the cyclotron U-200 and the phasotron for the production of ^{97}Ru, ^{111}In, ^{123}I, ^{178}W, ^{201}Tl, ^{237}Pu and some other nuclides from various targets at different energies of accelerated ions are considered. A project of a proton cyclotron dedicated to the production of radioisotopes is discussed. 18 refs.; 5 tabs.

15219 (UCRL-ID–118139) **Investigation of the particle selectivity of a traveling potential wave; neon isotope separation with the Solitron process. Final report.** Lowder, R.S. Lawrence Livermore National Lab., CA (United States). 26 Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010332. Source: OSTI; NTIS; INIS; GPO Dep.

The specific goal of this three year effort was to investigate this novel isotope separation process itself: to determine whether isotopes could indeed be separated and, if so, with what limitations–space charge effects, instabilities, and, in particular, with what throughput limitations. Termed the Solitron process, the concept is based on the strong isotopic variation in wave/ion interaction for a potential wave passing through an ion beam when the wave speed is near the ion speed. The ion's charge-to-mass ratio determines not only which ions are picked up by the wave but also the final energy of those ions that are picked up (accelerated to a

higher energy); thus, this method can be used for isotope separation. Much progress was made regarding separation and throughput, concluding that separation works well in conjunction with electrostatic focusing used to obtain enough throughput (enough beam current) to make a practical device. The next step would likely be a production device, although development of an appropriate metal ion source would be useful. Funding is an issue; development cost estimates run around two million dollars for a market only several times that cost. Although there is much concern about the future supply of isotopes such as could be produced by the Solitron process, as well as costs, at present the supply from Oak Ridge and Russian sources is adequate for US needs. Should demand grow, these LDRD studies would strongly support proposals for further development of this Solitron process and help assure its likely success. For example, a point design for a magnesium mission was formulated to obtain a consistent set of design numbers that would optimize performance without pushing any constraints seen in these studies. A similar design could be formulated for other missions (magnesium was just a convenient target).

15220 (WSRC-MS–94-0488) **Startup and Operation of a Metal Hydride Based Isotope Separation Process.** Scogin, J.H.; Poore, A.S. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950506–7: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95060101. Source: OSTI; NTIS; INIS; GPO Dep.

Production scale separation of tritium from other hydrogen isotopes at the Savannah River Site (SRS) in Aiken, SC, has been accomplished by several methods. These methods include thermal diffusion (1957–1986), fractional absorption (1964–1968), and cryogenic distillation (1967-present). Most recently, the Thermal Cycling Absorption Process (TCAP), a metal hydride based hydrogen isotope separation system, began production in the Replacement Tritium Facility (RTF) on April 9, 1994. TCAP has been in development at the Savannah River Technology Center since 1980. The production startup of this semi-continuous gas chromatographic separation process is a significant accomplishment for the Savannah River Site and was achieved after years of design, development, and testing.

0702 Radiation Sources

Refer also to citation(s) 16777

15221 (ENEA-RT-AMB–92-31) **Characterization of extrapolation chamber as measurement scale for beta radiations and implementation of irradiation equipment for dosimeter calibration.** Fantuzzi, E. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute); Monteventi, F. ENEA, Bologna (Italy). Area Energia Ambiente e Salute. Nov 1993. 36p. (In Italian). (RT/AMB–92-31). Order Number DE95771051. Source: OSTI; NTIS (US Sales Only).

A computerized system for beta dosimetry has been developed at the Divisione di Metrologia e Protezione delle Radiazioni Ionizzanti dell'ENEA Italian Agency for (New Technologies, Energy and Environment)di Bologna. The system allows an absolute measurement of superficial dose rate in tissue using an extrapolation chamber. After extrapolation chamber calibration, the system was validated using a $^{90}Sr+^{90}Y$ beta source. All experimental equipments and experimental data including all measured value corrections are described and specified. The dose rate Dt(0)has been determined with an uncertainty <2%. Finally, the values for different calibration distances of Dt(0) have been compared with the expected values with reference to the source calibration realized by PTB (Physikalisch Technische Bundesanstalt). Values agree within 1,5%.

15222 (INIS-JP–029, pp. 122-124) **Characterization of copper thin films prepared by metal self-ion beam sputter deposition.** Gotoh, Yasuhito (Kyoto Univ. (Japan). Faculty of Engineering); Amioka, Takao; Tsuji, Hiroshi; Ishikawa, Junzo. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

New deposition technique, 'metal-ion beam self-sputtering' method has been developed. Using metal ions which is the same element with the target material, no contamination with noble gas atoms, which are often used in the conventional sputtering, will occur. In this paper, fundamental measurement of the film purity is reported. As a result of PIXE measurements, it was clarified that only slight amount of iron is incorporated in the films. (author).

15223 (JINR-E–3-94-128, pp. 6-7) **Development of high-efficiency moderators for pulsed neutron sources.** Watanabe, N.; Kiyanagi, Y. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC MODERATORS/neutron sources; COLD NEUTRONS; EFFICIENCY; LIQUIDS; PULSED NEUTRON TECHNIQUES

15224 (JINR-E–3-94-128, pp. 7) **Neutronics of coupled solid methane moderator with premoderator.** Kiyanagi, Y.; Watanabe, N.; Higara, F.; Iwasa, H.; Satoh, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC MODERATORS/neutron sources; COLD NEUTRONS; GAIN; METHANE; PULSED NEUTRON TECHNIQUES; SOLIDS

15225 (JINR-E–3-94-128, pp. 12) **A feasibility study for a one-megawatt pulsed spallation source at Los Alamos National Laboratory.** Pynn, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIATION SOURCES/lampf linac; COOLING; FEASIBILITY STUDIES; PROTON BEAMS; TARGETS; TUNGSTEN

15226 (JINR-E–3-94-128, pp. 17) **The pulsed neutron sources for the Moscow meson factory on the basis of uranium targets.** Dementiev, A.D. (and others); Miroshnichenko, V.G.; Sidorkin, S.F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TARGETS/neutron sources; TARGETS/uranium silicides; CORROSION; MESON FACTORIES; PULSED NEUTRON TECHNIQUES; TARGETS

15227 (JINR-E–3-94-128, pp. 18) **The intense pulsed neutron sources for the IN-06 Moscow meson factory.** Grachev, M.I. (and others); Kravchuk, L.V.; Lebedev, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/meson factories; NEUTRON FLUX; PULSED NEUTRON TECHNIQUES; SHIELDING; THERMAL NEUTRONS

15228 (JINR-E–3-94-128, pp. 20) **Expanding the frontiers of neutron scattering.** Taylor, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed*

Neutron Sources PANS-II. Invited talks. 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/neutron diffraction; ISIS REACTOR; MATTER; PULSED NEUTRON TECHNIQUES; STRUCTURAL CHEMICAL ANALYSIS

15229 (JINR-E-3-94-128, pp. 28-29) **European spallation source: new scientific opportunities.** Finney, J.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194--: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES; NEUTRON DIFFRACTION; SPALLATION; STRUCTURAL CHEMICAL ANALYSIS

0703 Isotopic Power Supplies

Refer also to citation(s) 15728

15230 (DOE/SF/18852-T50) **GPHS-RTGs in support of the Cassini RTG Program. Semi annual technical progress report, September 26, 1994-April 2, 1995.** Martin Marietta Astro Space, Philadelphia, PA (United States). 20 Apr 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-91SF18852. Order Number DE95010306. Source: OSTI; NTIS; INIS; GPO Dep.

The technical progress achieved during the period 26 September 1994 through 2 April 1995 on Contract DE-AC03-91SF18852 Radioisotope Thermoelectric Generators and Ancillary Activities is described herein. Monthly technical activity for the period 27 February 1995 through 2 April 1995 is included in this progress report. The report addresses tasks, including: spacecraft integration and liaison; engineering support; safety; qualified unicouple production; ETG Fabrication, assembly, and test; ground support equipment; RTG shipping and launch support; designs, reviews, and mission applications; project management, quality assurance, reliability, contract changes, CAGO acquisition (operating funds), and CAGO maintenance and repair; and CAGO acquisition (capital funds).

0704 Economic, Industrial, and Business Aspects

15231 (INEL-95/0048) **Markets for reactor-produced non-fission radioisotopes.** Bennett, R.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008663. Source: OSTI; NTIS; INIS; GPO Dep.

Current market segments for reactor produced radioisotopes are developed and reported from a review of current literature. Specific radioisotopes studied in is report are the primarily selected from those with major medical or industrial markets, or those expected to have strongly emerging markets. Relative market sizes are indicated. Special emphasis is given to those radioisotopes that are best matched to production in high flux reactors such as the Advanced Test Reactor (ATR) at the Idaho National Engineering Laboratory or the High Flux Isotope Reactor (HFIR) at the Oak Ridge National Laboratory. A general bibliography of medical and industrial radioisotope applications, trends, and historical notes is included.

0705 Health and Safety

Refer also to citation(s) 16369

15232 (SAND-94-3009) **Preliminary safety analysis report for the gamma irradiation facility.** Boldt, K.R.; Walker, S.A.; Olbin, M.D. Sandia National Labs., Albuquerque, NM (United States). 1 Mar 1995. 228p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009882. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the safety analysis work performed for the Gamma Irradiation Facility (GIF) at Sandia National Laboratories (SNL), Albuquerque, New Mexico. The GIF is a new facility to be constructed at Sandia's Technical Area V, and combines the sources and capabilities of two existing irradiation facilities at the Laboratories. The analysis and content of this document meets the safety analysis report requirements of DOE Order 5480.23, "Nuclear Safety Analysis Reports." The characteristics of the facility, the site, and the operations are described and the hazards associated with operation of the facility are examined to evaluate the overall safety. A graded approach technique is employed in determining the level of detail for the analysis and documentation of the hazards associated with the facility. The analysis shows that there will be no off-site impact from operation of the GIF and that the facility can be safely operated to minimize the hazards to personnel at the site. The report concludes that operation of the GIF at SNL, presents an acceptable risk to health and safety of personnel on-site, off-site, and to the general public.

0707 Regulation and Licensing

Refer also to citation(s) 15646

08 HYDROGEN

15233 (NREL/CP-450-4972) **Proceedings of the 1992 DOE/NREL hydrogen program review.** Rocheleau, R.E. (Univ. of Hawaii, Honolulu, HI (United States). Hawaii Natural Energy Inst.); Gao, Q.H.; Miller, E. National Renewable Energy Lab., Golden, CO (United States). Jul 1992. 290p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-9205435--: 1992 DOE/NREL hydrogen program review, Honolulu, HI (United States), 6-7 May 1992). Order Number DE92010594. Source: OSTI; NTIS; GPO Dep.

These proceedings contain 18 papers presented at the meeting. While the majority of the papers (11) had to do with specific hydrogen production methods, other papers were related to hydrogen storage systems, evaluations of and systems analysis for a hydrogen economy, and environmental transport of hydrogen from a pipeline leak.

0801 Production

15234 (BNL-61364) **The Hy-C process (thermal decomposition of natural gas): Potentially the lowest cost source of hydrogen with the least CO_2 emission.** Steinberg, M. Brookhaven National Lab., Upton, NY (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95009542. Source: OSTI; NTIS; GPO Dep.

The abundance of natural gas as a natural resource and its high hydrogen content make it a prime candidate for a low cost supply of hydrogen. The thermal decomposition of natural gas by methane pyrolysis produces carbon and hydrogen. The process energy required to produce one mol of hydrogen is only 5.3% of the higher heating value of methane. The thermal efficiency for hydrogen production as a fuel without the use of carbon as a fuel, can be as high as 60%. Conventional steam reforming of methane requires 8.9% process energy per mole of hydrogen even though 4 moles of hydrogen can be produced per mole of methane, compared to 2 moles by methane pyrolysis. When considering greenhouse global gas warming, methane pyrolysis produces the least amount of CO_2 emissions per unit of hydrogen and can be totally eliminated when the carbon produced is either sequestered or sold as a materials commodity, and hydrogen is used to fuel the process. Conventional steam reforming of natural gas and CO shifting produces large amounts of CO_2 emissions. The energy requirement for non-fossil, solar, nuclear, and hydropower production of hydrogen, mainly through electrolysis, is much greater than that from natural gas. From the resource available energy and environmental points of view, production of hydrogen by methane pyrolysis is most attractive. The by-product carbon black, when credited as a saleable material, makes hydrogen by thermal decomposition of natural gas (the Hy-C process) potentially the lowest cost source of large amounts of hydrogen.

15235 (NEI-DK–1876) **Hydrogen system for the village where green research is carried out.** Yde, L. Nordvestjysk Folkecenter for Vedvarende Energi, Hurup (Denmark). Jul 1994. 77p. (In Danish). Contract TR-89.0345. Order Number DE95766507. Source: OSTI; NTIS.

Three engineers from Ukraine installed a 20 kW electrolysis system at the 'Nordvestjysk Folkecenter for Vedvarende Energi' (North-West Folk Centre for Renewable Energy) at Thy (Denmark). The system should be used for storing electric power from a wind turbine for three days at a time at the 'Landsbyen for Groen Forskning' (The Village where Green Research is Carried Out). On windy days water is split into oxygen and hydrogen in the electrolysis plant with the help of the electricity produced by the wind turbine. The hydrogen should be stored in a 60m^3 tank under a pressure of up to 10 bar. On less windy days the hydrogen would be used as fuel in a cogeneration plant which provides the village with electricity. The design of these systems and the way they work together are described in detail. (AB)

15236 (NEI-DK–1960) **Hydrogen upgrading.** Gang Xiao; Bjerrum, N.J. Danmarks Tekniske Univ., Lyngby (Denmark). Kemisk Lab. A. Mar 1995. 45p. Contract ENS-1443/92-0006. Order Number DE95772387. Source: OSTI; NTIS.

EFP-92.

The objective of this project is, by explorative research, to develop an electrochemical hydrogen separation device (EHS) for cost-effective hydrogen recovery from various dilute hydrogen streams. Much efforts were made in the project to optimise the manufacturing of the gas-diffusion electrodes. From the test results it can be concluded that the high-surface-area carbon black - Vulcan XC-72 - is the best support material for the catalyst. We have tried to wet-proof the carbon backing paper with different concentrations of PTFE solutions. It was found that the paper treated with 30% PTFE resulted in a optimal performance of the electrode. At this concentration the carbon paper kept its high porosity and was still wet-proof. During this project we have successfully produced the SiC matrix layer with a thickness of 0.2 mm. This is thin enough to give a internal cell resistance on only 10 mΩ (active electrode area was 25 cm^2) and still thick enough to prevent impure gases form crossing over the matrix. Large effort were made to solve the problem of catalyst poisoning by CO. The most promising method was found to be the addition of O_2 to the CO-containing feed gas. Major part of the CO in the feed gas can be oxidized to CO_2 resulting in less poisoning of the catalyst. This positive effect was well confirmed both by electrochemical half-cell measurements and by EHS measurements. The results and experiences from this work can be used to obtain high purity hydrogen from, for example, molten carbonate fuel cell anode exhaust. As a further development of the project the manufacturing and testing of a EHS stack is suggested. (au) (21 refs.)

09 BIOMASS FUELS

15237 (DOE/OR/21389–T12) **Northeast Regional Biomass Program. First–fourth quarter report, October 1, 1992–September 30, 1993.** CONEG Policy Research Center, Inc., Washington, DC (United States). Jun 1994. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-83OR21389. Order Number DE95010166. Source: OSTI; NTIS; GPO Dep.

The Northeast Regional Biomass Program (NRBP) continued to work toward its objectives during the tenth year. These are: improve the effectiveness, coordination and planning capabilities of the state agencies in the region which have biomass-related responsibilities; assess the availability of biomass energy resources; provide reliable information to private companies, residential and commercial consumers, and public institutions about the potential and versatility of biomass energy sources; better understand and mitigate the environmental impacts of increased biomass energy use without stifling the region's ability to take advantage of its most abundant indigenous renewable energy resource; transfer the results of government-sponsored and private research and development to the private sector; support region-specific and interregional studies of the critical impediments to further development of biomass energy resources; and coordinate the regional program with other federal, state and regional efforts to avoid duplication and maximize the effectiveness of NRBP dollars. The technical status of 14 projects is described.

0907 Resources

15238 (ETDE-DE–86) **Biotechnology for breeding industrial rape: Characterisation and isolation of fatty acid elongases from Lunaria annua. Final report.** Schoepker, H.; Fehling, E.; Mukherjee, K.D. Bundesanstalt fuer Getreide-, Kartoffel- und Fettforschung, Muenster (Germany). Inst. fuer Biochemie und Technologie der Fette. [1995]. 96p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0319412J. Order Number DE95770121. Source: OSTI; NTIS (US Sales Only).

The present part-project of the BMFT (Federal Ministry of Research and Technology) integrated project 'Industrial Rape Biotechnology' was aimed at isolating and characterising the constituent enzymes of fatty acid elongase (acyl-CoA-elongase) that catalyse the biosynthesis of extra-long-chain fatty acids (erucic and nervonic acid). This was in preparation of cloning and transferring the responsible elongase genes to rape. The constituent enzymes of acyl-CoA elongase from lunaria annua were isolated using insights gained in preceding studies of the integrated project. The ripencing seeds of this singular crucifer synthesise erucic acid and an unusually high proportion of nervonic acid. These examinations provide the basis to studies for cloning the elongase genes and transferring them to rape. The ultimate aim is to create an industrial rape rich in erucic and nervonic acid, a reproductive raw material that would be of great interest to the chemico-technical sector. (EF)

15239 (NREL/SP–420-5570-Rev.2) **BioFacts: Fueling a stronger economy. Methanol from biomass. Revision 2.** National Renewable Energy Lab., Golden, CO (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95010302. Source: OSTI; NTIS; GPO Dep.

This informational pamphlet written by The National Renewable Energy Laboratory discusses obtaining methanol, a liquid transportation fuel, from biomass, defined as crop residues, grasses, forest residues, short-rotation tree crops, and more than half of the municipal solid waste and industrial waste streams. The biomass resource is proposed in place of fossil domestic resources such as natural gas, coal and residual oil. Advances in production, processing and pilot plant design, as well as utilization concerns and environmental advantages, are addressed.

0908 Production

15240 (ANL/ES/CP–85392) **Producing usable fuel from municipal solid waste.** Ohlsson, O.O. Argonne National Lab., IL (United States). [1995]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941210–13: Power generation conference, Orlando, FL (United States), 7-9 Dec 1994). Order Number DE95008405. Source: OSTI; NTIS; GPO Dep.

Refuse disposal is a matter of increasing concern for municipalities and state governments. As existing land-fills become filled to capacity, and new landfills become more costly to site, it has become critical to develop alternative disposal methods. Some of the refuse that is presently being landfilled has the potential to provide considerable quantities of energy and thereby replace conventional fossil fuels. Another environmental concern is the problem of the emissions associated with combustion of traditional fossil fuels. The Clean Air Act Amendments of 1990 significantly restrict the level of sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions permissible as effluent from combustion facilities. To address both of these concerns, Argonne National Laboratory, under sponsorship of the U.S. Department of Energy (DOE), has developed a means of producing fuel from municipal solid waste that can be co-fired with coal to supplement coal supplies and reduce problematic emissions.

0909 Processing

Refer also to citation(s) 15239, 15813

15241 (NEI-DK–1883) **Cleaning of biogas by removal of CO_2 and H_2S using pressurized water.** Jysk Biogas, Farsoe (Denmark). [1995]. 27p. (In Danish). Contract ENS-51161-93.0041. Order Number DE95766513. Source: OSTI; NTIS.

Carbon dioxide and hydrogen sulphide should be removed from methane so that it could be used as fuel for cars or in the natural gas distribution network. Pressurized water was to be used for this process and the plant should be of simple design and inexpensive in use. A pilot plant was built and found to be effective. The design of the plant is described. Measurements showed that the pressurized water cleaning system can improve and clean the biogas resulting in methane of a high quality suitable to be used in a gas distribution network. It is reckoned that the capacity is 10 cubic meters per hour. (AB)

15242 (NEI-DK–1884) **Catalytic cleaning of gas from straw gasification. Parameter experiment.** Energiministeriets Forskningsprogram 91. Anvendelse af biomasse til energiformaal. Pedersen, K. Dansk Teknologisk Inst., Aarhus (Denmark). Miljoeteknik. Jan 1995. 143p. (In Danish). Contract ENS-1383/91-0004. Order Number DE95766512. Source: OSTI; NTIS.

EFP-91.

Various catalysts were tested in relation to different gas compositions and temperatures in order to find their modes of operation. The three types examined were a sulphidic one incorporating nickel and molybdenum on alumina, an oxidic one with chromium oxide on metal oxide and a metallic one with platinum on alumina and copper on silicate. The procedures for activation, regeneration, the operation of the catalyst systems and the process layout for the cleaning system were established. The platinum catalyst is too sensitive to the carbon monoxide in the gas for practical use. Too much carbon is produced at temperatures above 450 degrees centigrade and it is very expensive. The copper catalyst deactivates in the face of sulphur and can not be used. When temperatures are over 550 deg. cen. the rate of sintering is too high in the case of the metal oxide and sulfidic catalyst which operates best at 400-550 deg.cen. Those catalysts that are de-activated by carbon formation can be reactivated by burning up carbon compounds using recirculation of hot gas with an inlet temperature of 250 deg.cen. Here the adiabatic rise in temperature must not exceed 550 deg.cen. One of the carbon substances identified reacts at a temperature of 100-150 deg.cen, the other at 250-300 deg.cen. An activation method was developed where watery methanol with a content of 50% is added to the hot recirculation circuit. During activation of the metal oxide catalyst the consumption of methanol is ca. 45 kg per cubic meter catalyst. For the sulphidic system consumption is ca.10kg methanol and 60 kg carbon disulphide per cubic catalyst. (AB) (42 refs.)

15243 (NEI-DK–1978) **Rough delimbing of energy-trees. Felling, carting, chipping and road transport.** Skovbrugsserien, 9. Kofman, P.D; Hedsing, N.; Suadicani, K. Forskningscentret for Skov og Landskab, Lyngby (Denmark). 1994. 48p. (In Danish). Contract ENS-1383/90-0006. Order Number DE95772385. Source: OSTI; NTIS.

EFP-90.

Logging and chipping of roughly delimbed fuelwood was carried out with an adapted one-grip harvester in 5 Sitka spruce stands (one 1st, three 2nd and one 3rd thinning). At the 1st and 2nd thinning only round fuelwood was produced. At 3rd thinning short timber was also produced. The study includes logging of all stands as well as chipping at the roadside of two stands. The wood from three stands was forwarded by truck to the Maabjerg Plant and chipped there with a semi-stationary chipper. A comparison was made between chipping of ordinary three-meter pulpwood and chipping of roughly delimbed three-meter pulpwood. Time consumption and costs of producing round fuelwood are higher than the cost when trees are chipped in the stand at the place of felling. By driving the chipper into the stand the trees can be chipped with their branches. Debranching costs almost the same as chipping. Results indicate that production of round roughly delimbed fuelwood is profitable if other assortments are produced at the same time. Results of the third thinning indicate that production of round fuelwood is most profitable when the harvester and the forwarder are already in the stand to produce a more valuable assortment. This would mean use of four expensive machines in order to carry through a thinning with limited logging volume per ha. It was shown that forwarding of round roughly delimbed fuelwood is a little cheaper per unit than forwarding a chips. Likewise chipping at a plant is cheaper than chipping of piled round fuelwood at the roadside in the forest. (AB)

15244 (NREL/SP–420-5571-Rev.2) **BioFacts: Fueling a stronger economy, Biodiesel. Revision 2.** National Renewable Energy Lab., Golden, CO (United States). Jan 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95010303. Source: OSTI; NTIS; GPO Dep.

Biodiesel is a substitute for or an additive to diesel fuel that is derived from the oils and fats of plants. It is an alternative fuel that can be used in diesel engines and provides power similar to conventional diesel fuel. It is a biodegradable transportation fuel that contributes little, if any, net carbon dioxide or sulfur to the atmosphere, and is low in particulate emission. It is a renewable, domestically produced liquid fuel that can help reduce US dependence on foreign oil imports. This overview presents the resource potential, history, processing techniques, US DOE programs cost and utilization potential of biodiesel fuels.

15245 (NREL/SP–420-6379) **BioFacts: Fueling a stronger economy, Thermochemical conversion of biomass.** National Renewable Energy Lab., Golden, CO (United States). Dec 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94006866. Source: OSTI; NTIS; GPO Dep.

A primary mission of the US DOE is to stimulate the development, acceptance, and use of transportation fuels made from plants and wastes called biomass. Through the National Renewable Energy Laboratory (NREL), Doe is developing and array of biomass conversion technologies that can be easily integrated into existing fuel production and distribution systems. The variety of technology options being developed should enable individual fuel producers to select and implement the most cost-effective biomass conversion process suited to their individual needs. Current DOE biofuels research focuses on the separate and tandem uses of biochemical and thermochemical conversion processes. This overview specifically addresses NREL's thermochemical conversion technologies, which are largely based on existing refining processes.

15246 (NYSERDA–95-4) **Thermal sludge dryer demonstration: Bird Island Wastewater Treatment Plant, Buffalo, NY. Final report.** New York State Energy Research and Development Authority, New York, NY (United States); Buffalo Sewer Authority, NY (United States); Nussbaumer and Clark, Inc., Buffalo, NY (United States). Jan 1995. 155p. Sponsored by New York State Energy Research and Development Authority, Albany, NY (United States). Source: OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223 (United States).

The Buffalo Sewer Authority (BSA), in cooperation with the New York State Energy Research and Development Authority (Energy Authority), commissioned a demonstration of a full scale indirect disk-type sludge dryer at the Bird Island Wastewater Treatment Plant (BIWWTP). The purpose of the project was to determine the effects of the sludge dryer on the sludge incineration process at the facility. Sludge incineration is traditionally the most expensive, energy-intensive unit process involving solids handling at wastewater treatment plants; costs for incineration at the BIWWTP have averaged $2.4 million per year. In the conventional method of processing solids, a series of volume reduction measures, which usually includes thickening, digestion, and mechanical dewatering, is employed prior to incineration. Usually, a high level of moisture is still present within sewage sludge following mechanical dewatering. The sludge dryer system thermally dewaters wastewater sludge to approximately 26%, (and as high as 38%) dry solids content prior to incineration. The thermal dewatering system at the BIWWTP has demonstrated that it meets its design requirements. It has the potential to provide significant energy and other cost

savings by allowing the BSA to change from an operation employing two incinerators to a single incinerator mode. While the long-term reliability of the thermal dewatering system has yet to be established, this project has demonstrated that installation of such a system in an existing treatment plant can provide the owner with significant operating cost savings.

15247 (PNL–10513) **Low-temperature catalytic gasification of wet industrial wastes. FY 1993–1994 interim report.** Elliott, D.C.; Hart, T.R.; Neuenschwander, G.G.; Deverman, G.S.; Werpy, T.A.; Phelps, M.R.; Baker, E.G.; Sealock, L.J. Jr. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010205. Source: OSTI; NTIS; GPO Dep.

Process development research is continuing on a low-temperature, catalytic gasification system that has been demonstrated to convert organics in water (dilute or concentrated) to useful and environmentally safe gases. The system, licensed under the trade name Thermochemical Environmental Energy System (TEESO), treats a wide variety of feedstocks ranging from hazardous organics in water to waste sludges from food processing. The current research program is focused on the use of continuous-feed, tubular reactors systems for testing catalysts and feedstocks in the process. A range of catalysts have been tested, including nickel and other base metals, as well as ruthenium and other precious metals. Results of extensive testing show that feedstocks, ranging from 2% para-cresol in water to potato waste and spent grain, can be processed to > 99% reduction of chemical oxygen demand (COD). The product fuel gas contains from 40% up to 75% methane, depending on the feedstock. The balance of the gas is mostly carbon dioxide with < 5% hydrogen and usually < 1% ethane and higher hydrocarbons. The byproduct water stream carries residual organics from 10 to 1,000 mg/l COD, depending on the feedstock. The level of development of TEES has progressed to the initial phases of industrial process demonstration. Testing of industrial waste streams is under way at both the bench scale and engineering scale of development.

0910 Properties and Composition

15248 (SVF–530) **Comparison of different methods for the characterization of particle properties in fuel powders of wood, peat, olive stones, and coal.** Ryk, L. (SGS Sweden Solid Fuels and Minerals, Stockholm (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 134p. (In Swedish). Project Vaermeforsk-03-306. Order Number DE95766638. Source: OSTI; NTIS.

Figures and tables with text in English.

This report describes parallel tests to determine particle size distributions by conventional sieve-analysis, by laser diffraction and by image analysis. Specific surface was also determined. Tested material: pulverized coal and peat, dolomite powder, wood chips, milled wood chips, crushed olive stones and milled olive stones. Quite different distributions are obtained by the different methods. Especially for peat and wood chips and milled wood chips, image analysis show a much flatter particle size distribution. Thus indicating a larger portion of coarse and fine grains than shown by sieve-analysis. The importance of being able to optimize the grinding operation from a combustion-point-of-view has not been quantified. For particles like pulverized coal, laser diffraction is the most suitable method. Apart from the 'sieve-analysis' other parameters may be calculated with laser diffraction showing the importance of fine or coarse particles. Image analysis is well suited for peat, wood chips and milled wood chips. Except giving a 'sieve-analysis', image analysis may also give the distribution of various shaped grains in different fractions. Maximum and most correct information is obtained by a combination of laser diffraction and image analysis. Conventional sieve-analysis is, however, a simple and cheap way to obtain information. Although limited when biofuels and peat are screened, relative information regarding changes in size-distribution is obtained. 8 refs, 14 figs, 2 tabs, 3 appendices

15249 (TVA/LR/NRM–92/3) **A collection of wood properties. Version 1.1.** Toennisson, R.L. Tennessee Valley Authority, Norris, TN (United States). Forest Resources Development Program. Sep 1992. 22p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE95008552. Source: OSTI; NTIS; GPO Dep.

Reference books are the primary source of wood property data for use in research, school, or business. it has been our experience that obtaining the needed data from several references can be a cumbersome and time-consuming ordeal. These spreadsheets are a compilation of data from several well-known references. Version 1.1 includes the most recent update of commercial woods of the United States and the world. It is intended that they be used for quick summaries, comparisons, and calculations to increase the efficiency of the professional user in report preparation.

0920 Combustion

Refer also to citation(s) 15240, 15246, 15373

15250 (DOE/CE/15612–T3) **Combustion of municipal solid wastes with oil shale in a circulating fluidized bed. Second quarterly report ending March 31, 1995.** Synfuels Engineering and Development, Inc., Arvada, CO (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15612. Order Number DE95010174. Source: OSTI; NTIS; GPO Dep.

The Project Description lists and describes six tasks, three of which are virtually complete, with three others underway. A summary of progress on each task follows. Task 1: Development of a Detailed Test Plan. This task is complete. Task 2: Preparation of Test Equipment. This task is complete. Two test units (a six-inch internal diameter and a fifteen-inch internal diameter unit) were prepared and used as described under Task 4. Task 3: Obtain test materials. The required amounts of oil shale and pelletized municipal solid waste have been obtained, tested, and found to be suitable. We have obtained an adequate quantity of a pelletized "standard" MSW from BEPR/BFI, Eden Prairie, MN. For test purposes, we synthesized the desired "worst probable case" of MSW by the addition of sulfur and chlorine to reach the sulfur and chlorine levels characteristic of such waste. Task 4: Execute Feasibility Demonstration Program. The fluidized bed tests associated with the program have been completed. Analysis of the results is continuing. Testing of the waste stream material generated from these runs will begin about 6 April to evaluate its possible use as cement for specific applications. Information on the technical feasibility of the invention as indicated by the fluid bed test program is included as Attachment A. The results demonstrate that the process is technically feasible. Task 5: Data Analysis. This task is beginning. Task 6: Project Management, Reporting, and Necessary Liaison Activities. Those portions of this task associated with work done on Tasks 1 through 4 have been completed. This task will continue throughout the period of the study. In summary, work is proceeding within budget. No serious problems in the next scheduled tasks are foreseen.

15251 (DOE/CE/40735–2) **Development of a gravel bed combustor for a solid fueled gas turbine for the period February 1, 1989 to June 30, 1991.** Ragland, K.W.; Aerts, D.J.; Palmer, C.A. Wisconsin Univ., Madison, WI (United States). Dept. of Mechanical Engineering. Jun 1992. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85CE40735. Order Number DE95009677. Source: OSTI; NTIS; GPO Dep.

Further work on a novel pressurized, downdraft combustor using aspen woodchips is reported for the period 2/89 to 6/91. The 42 cm i.d combustor was connected to a modified Allison 250-C20B gas turbine engine and operated for 250 hours. The performance of the combustor-turbine system is discussed. Deposits of ash on the turbine nozzles and rotors are identified and discussed. A dynamic simulation model for the combustor-turbine system is presented and used to investigate the control of the system. The highest net power output was 61 kW or 20% of full power; the highest turbine speed was 75% of the maximum speed; the highest mass flow was 50% of the full power flow. The stability of the combustor must be improved before higher output and longer runs can be achieved.

15252 (DOE/CE/40735–3) **100 Hour test of the pressurized woodchip-fired gravel bed combustor.** Ragland, K.W.; Aerts, D.J. Wisconsin Univ., Madison, WI (United States). Dept. of Mechanical Engineering. Aug 1992. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85CE40735. Order Number DE95009678. Source: OSTI; NTIS; GPO Dep.

In this project a downdraft, packed bed combustor for a gas turbine cogeneration system using woodchips is being developed. The combustor is designed to promote intense combustion in a thin reaction zone and to control particulate growth by using high excess air. The combustor contains a magnesia and alumina gravel bed on top of which woodchips are fed. The following test objectives were established for the 100 hr test: (a) demonstrate preliminary durability of the combustor; (b) demonstrate steady operation of the system; (c) investigate combustor pressure drop; (d) investigate bed ash cake buildup; (e) expose metal alloy coupons for corrosion examination; (f) obtain closure within 10% on mass and energy balances; and (g) obtain emissions data. The plan for the 100 hr test was to operate the combustor at the following conditions: day 1, 4 atm (absolute) pressure and 700–800 C outlet temperature; day 2, 4 atm pressure and 800–900 C outlet temperature; day 3, 5 atm pressure and 800–900 C outlet temperature; days 4 and 5, repeat day 3. The inlet air was not preheated. The paper gives test results and discusses fuel characterization, combustor performance, mass and energy balance, emissions, composition of ash and deposits, and metal coupons representing turbine blade material.

15253 (NEI-DK–1948) **Optimization of straw-fuelled district heating plants.** Energiministeriets Forskningsudvalg for produktion og fordeling af el og varme. Braendsler og forbraendingsteknik. Dahlin, J.; Ravn-Jensen, L.; Nielsen, C. Dk-TEKNIK, Soeborg (Denmark). Energi og Miljoe. Dec 1994. 69p. (In Danish). Contract ENS-1323/91-0023. Order Number DE95772349. Source: OSTI; NTIS.

EFP-91.

A description of the background, methods and results of 3 subprojects dealing with the optimization of straw-fuelled district heating plants in Denmark. These are an experiment at Loejt Kirkeby on air distribution and several fuelling techniques related to 'cigar' fuelling, and on manures and the reduction of nitrogen oxides, an experiment at Roedby harbour district heating plant where improvements were made at the batch-fired whole-bale system and an experiment at Mariager district heating plant where measurements were taken at a straw-fuelling system where straw is fuelled in small pieces. At Loejt Kirkeby carbon monoxide and nitrogen oxides in the flue gas were reduced, the former significantly, and in relation to the injection of liquid manures NO_x emission was decreased. The water content of the manure resulted in energy loss. At Roedby harbour where batch fuelling was changed to continual fuelling and where spaces in the walling of the combustion chamber were filled in with masonry and combustion air was lead through jet nozzles for counter-current combustion, these changes resulted in a rise of temperature from 500 to 1000 degrees centigrade in the boiler, satisfactory burnup and amount of combustion air, a significant reduction of CO emission, less odour, improved combustion quality and improved efficiency. At Mariager where a straw divider system is used the combustion air distribution was improved, leading to a reduction of CO emission from 2000 ppm to 700 ppm. Earlier fluctuations in CO concentration were lessened. (AB)

15254 (NEI-DK–1949) **Fuelling with wet wood-fuel chips. Fuelling experiment at district heating plants with wood-fuel chips consisting of fresh, mechanically de-needled whole trees.** Energiministeriets Forskningsudvalg for produktion og fordeling af el og varme. Braendsler og forbraendingsteknik. Houmann Jakobsen, H. Dk-Teknik, Soeborg (Denmark). Jan 1995. 106p. (In Danish). Contract ENS-1323/90-0012. Order Number DE95772348. Source: OSTI; NTIS.

EFP-90.

The consequences of using wood fuel chips produced from recently felled, mechanically de-needled whole trees were investigated through fuelling experiments at two Danish heating plants at Hovedgaard and Kibaek. Each plant had condensing flue gas cooling facilities. When the needles are removed mechanically in the forest the parts of the whole tree which are not to be used can be removed immediately so that there is a minimum need to use heavy vehicles which churn up the forest floor. Wood chip moisture content is dependent on the length of time they are left in the forest before delivery at the plants. The effect on combustion of burning fresh wood chips with a high moisture content are described in addition to any technological adjustments that were be needed in this situation. Wood from three types of trees and varied moisture content was used. It was found that it was the ability of the combustion system to maintain a high quality of combustion which set the limits of moisture content of this fuel, allowing for satisfactory combustion. Low emission was also of importance. It was shown that it could be economically advantageous to use wood chips with a moisture content of over 50%, which means that wood from Norwegian spruces are not suitable. The Firbaek plant has tried sandwich fuelling - laying wood pills over the wet wood chips and this has made it possible to combust wood chips with a moisture content of 58% satisfactorily. (AB)

15255 (NEI-DK–1953) **Development of woodchip-fired gasification system for cogeneration plant.** Houmann Jakobsen, H.; Stenholm, M.; Christiansen, K. Dk-TEKNIK, Soeborg (Denmark). Energi og Miljoe. Nov 1994. 193p. (In Danish). Contract ENS-51161-91.0038. Order Number DE95772376. Source: OSTI; NTIS.

A new type of system was developed for the gasification of wood chips at cogeneration plants, and the market for such a system was investigated. Demands on a lower moisture content and a larger size of wood chip would mean that production methods would have to change and this would increase costs. A moisture content of lower than 25% could not be achieved. A change in the size of the chips would also involve expensive changes in production methods and forestry and drying equipment. It is pointed out that within a free market the development of wood gasification systems is wholly dependent on the economical situation of the consumers. A wood gasification system (capacity: 50 kW_e) with a new Open Core gas generator, was designed for use at a center for further education. This is described in detail. Total costs were estimated at ca. 1,995,000 Danish kroner. The Danish market for gasification systems for cogeneration plants will consist of existing biomass-fuelled plants that find it necessary to change out equipment and smaller towns with no established district heating system that have the necessary economical means. The Eastern European countries should also provide a market for wood gasification systems. Taking a profit into consideration with regard to optimizing a 500 kW_e gasification system within a cogeneration plant, it was reckoned that the total investment (for the whole plant) would be ca. 9.5 million Danish kroner, about 19,000 kroner per kW_e. It is concluded that the development of such a wood gasification system could contribute significantly to a market based on the use of biomass to produce energy. (AB)

15256 (NEI-DK–1976) **Electricity and heating based on wood chips for Mosbjerg and Tolne. A pilot project.** Soerensen, P.A. (PlanEnergi, Skoerping (Denmark)); Muenster, E.; Houmann Jakobsen, H.; Christensen, O.; Falk, J. Planenergi S/I, Nordjylland (Denmark). [1995]. 110p. (In Danish). Contract ENS-51161-94.0048. Order Number DE95772378. Source: OSTI; NTIS.

The project has shown that there are sufficient resources of wood chips in the locality to enable the operation of a cogeneration plant and that the amount of wood chips can be increased significantly if short rotation forest cultivation is utilized. The capacity of the plant would be 1.5 MW and ca. 0.4 MW. 4 types of gasification systems are described, two of which, in addition to Stirling and steam motor techniques, are applicable. Gas from concurrent gasifiers can be burnt in the Jenbacher gas motor and gas from counter current gasifiers will be burnt if tar condensation can be avoided before combustion. Calculations were made of consumer prices in the case of individual oil burners, cogeneration plants fired with natural gas and fired with wood chips. The size of the percentage of subsidization of the plant which would bring down the price of heating to the same level as for individual heating by oil burners was also calculated. Results are presented. Calculations were also carried out with regard to the use of a small Stirling motor. Cost calculations are tentative. The use of a Stirling motor would result in a reduction by 63.3 tons sulphur dioxide, 33.5 tons

of nitrogen oxides and 69.500 tons of carbon dioxide, which is significant. If the project is to be realized it is recommended that two companies are established so that eventual extra costs do not have to be met by the consumers. (AB)

15257 (NYSERDA–95-5) **Combustion testing and heat recovery study: Frank E. Van Lare Wastewater Treatment Plant, Monroe County. Final report.** New York State Energy Research and Development Authority, New York, NY (United States); Monroe County Dept. of Engineering, Rochester, NY (United States); Malcolm Pirnie, Inc., Rochester, NY (United States). Jan 1995. 146p. Sponsored by New York State Energy Research and Development Authority, Albany, NY (United States). Source: OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223 (United States).

The objectives of the study were to record and analyze sludge management operations data and sludge incinerator combustion data; ascertain instrumentation and control needs; calculate heat balances for the incineration system; and determine the feasibility of different waste-heat recovery technologies for the Frank E. Van Lare (FEV) Wastewater Treatment Plant. As an integral part of this study, current and pending federal and state regulations were evaluated to establish their impact on furnace operation and subsequent heat recovery. Of significance is the effect of the recently promulgated Federal 40 CFR Part 503 regulations on the FEV facility. Part 503 regulations were signed into law in November 1992, and, with some exceptions, affected facilities must be in compliance by February 19, 1994. Those facilities requiring modifications or upgrades to their incineration or air pollution control equipment to meet Part 503 regulations must be in compliance by February 19, 1995.

0930 Economic, Industrial, and Business Aspects

15258 (INIS-mf–14507) **Biomass energy in Jordan, and its potential contribution towards the total energy mix of the Kingdom.** Al-Dabbas, Moh'd A. F. (ed.). Ministry of Energy and Mineral Resources, Amman (Jordan). Apr 1994. 20p. (In Arabic). Order Number DE95628116. Source: OSTI; NTIS (US Sales Only); INIS.

Report reviewed by Mr. Ziad Jibril from the Ministry of Energy and Mineral Resources, Amman (Jordan).

An evaluation of Jordan's bio-energy status was carried out. Available sources and the viability of exploitation were studied in order to identify the size of contribution that bio-energy could provide to the total energy mix of the Kingdom. The advantages of biogas technology were discussed, and a general description of Jordan's experience in this field was presented. Data on Jordan' animal, municipal, and agricultural wastes that are available as a potential source of bio-energy was tabulated. The report ascertained the economic feasibility of biogas utilization in Jordan, and concluded that the annual energy production potential from biogas, with only animal wastes being utilized, would amount to 80,000 ton oil equivalent. This amount of energy is equivalent to 2% of Jordan's total energy consumption in 1992. The utilization of biogas from municipal wastes would produce an additional 2.5% of the total energy consumption of Jordan. The annual value of utilizing animal and municipal wastes would reach 23 million Jordanian Dinars (JD). This value would increase to 61.5 million JD with the utilization of human wastes. The investment required for the utilization of bio-energy sources in Amman and its suburbs on the scale of family unit fermenters was estimated to be in the order of a million JD. The size of investment for industrial scale utilization for power generation with an electricity feed to the national grid, would range from 3 to 4 million JD. (A.M.H.). 8 refs., 4 tabs.

15259 (NEI-DK–1942) **Wood fuel resources from the Danish forests bigger than 0.5 ha. Status and forecast.** Skovbrugsserien, 10-1994. Hougs Lind, C. Forskningscentret for Skov og Landskab, Lyngby (Denmark). 1994. 210p. (In Danish). Contract ENS-51161-93.0032. Order Number DE95772356. Source: OSTI; NTIS; INIS.

In this report fuel wood resources available for large scale energy production in the period 1990-2019 are estimated. Estimates are based on the comprehensive Danish 1990 National forest Inventory covering forests above 0.5 ha. The inventory comprises data on e.g. tree species, age class, and yield class. All resource estimates are made countywise and as averages in 10 year periods, that is the periods 1990-1999, 2000-2009 and 2010-2019. Future annual felling is calculated from yield tables for the tree species most common and area extrapolation models including afforestation. The forest products most commonly produced are commercial wood in the form of timber and logs for sawmills and other wood industries and industrial wood for chip board, packing, and paper production, etc. as well as fuel wood including chips for energy purposes. In general, only the small-dimensioned parts of the trees are used for fuel wood. The present annual production/consumption of fuel wood is 553.000 cbm(s) (263.000 tdm). Certain industrial wood assortments including pulpwood could be produced from volume 0-10 cm. However, fuel wood, mainly chips, could be produced from volume 10-15 cm. The price relations between industrial wood and chips will determine the felling practice, as the wood has competitive uses: If the prices of industrial wood are low and the marketing conditions difficult, chipping is encouraged at the expense of industrial wood. If the prices of industrial wood are high and marketing conditions good, the industrial wood production is encouraged at the expense of chips. The marginal return at mechanical felling operations varies with the felling practice and with the diameter of the thinning. Below a certain thinning diameter, the trees and the felling volume are too small to make production of industrial wood profitable. In this case it will be most profitable to produce chips from the total felling volume. (Eg) (37 refs.)

0940 Transport, Handling, and Storage

Refer also to citation(s) 15243

15260 (NEI-DK–1906) **Collection of gas from a storage tank with a concrete lid, at Skovsgaard.** Johansen, K. Jysk Biogas, Farsoe (Denmark). [1995]. 16p. (In Danish). Contract ENS-51161-92.0017. Order Number DE95766486. Source: OSTI; NTIS.

It was investigated whether it was possible to establish the collection of methane from an 18 meter/diameter storage tank with a layered concrete lid at a biomass conversion plant on a Danish farm. The tank was not effectively sealed and also it could not withstand too much pressure. The use of suction when the lid was fixed could result in too little pressure, or too much, within the storage tank. A satisfactory collection of methane form the tank would result in a reduction of odor. A 100 mm tube was connected to the tank, it sloped so that any water could flow back. A blower was fitted to extract the methane, the pressure was regulated via a pressure transmitter and a frequency transformer. A safety system ensured that pressure was neither too high nor too low for the storage tank. The system worked satisfactorily with the exception of the fact that the pressure rose when the methane was pumped out, but this could be regulated. The storage tank was properly sealed and covered with a rubber material and the methane collection system has now been in use for two years. The safety system has also proved satisfactory. (AB)

0950 Environmental Aspects

Refer also to citation(s) 15239, 16510

15261 (LUTMDN-TMVK–3170) **Measurements on and simulations of a biogas-fuelled bus.** Olsson, L.O.; Nilsson, Johan. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Mar 1995. 37p. (In Swedish). Order Number DE95766670. Source: OSTI; NTIS; INIS.

Mathematical models for torque/fuel consumption and emissions have been studied for a biogas-fuelled bus used in urban traffic in Linkoeping, Sweden. It is noted that the cycle ECE R-49 is not representative for city buses, but that the Braunschweig cycle gives rather good agreement. 2 refs, 37 figs

0960 Health and Safety

15262 (SNV–4223) **Health hazards from wood firing.** Victorin, K. (Karolinska Institutet, Stockholm (Sweden)). Swedish Environmental Protection Agency, Solna (Sweden). Jul 1993. 23p. (In Swedish). Order Number DE95766690. Source: OSTI; NTIS.

Recent measurements of air emissions from small-scale wood firing have shown high concentrations of VOC, which have not earlier been analyzed. Possible health risks from these emissions are discussed in this report. It is noted that the lack of data for certain compounds, and of epidemiological surveys of exposed populations makes it impossible to give estimates e.g. of cancers caused by these emissions. 31 refs. 2 tabs

15263 (SNV–4224) **Small-scale wood firing and cancer risks. Review of data.** Ehrenberg, L. (Stockholm Univ. (Sweden). Straalningsbiologiska inst.); Toernqvist, M. Swedish Environmental Protection Agency, Solna (Sweden). Jul 1993. 38p. (In Swedish). Order Number DE95766691. Source: OSTI; NTIS.

Cancer risks due to emission from wood-fired boilers were estimated on the basis of analytical studies of emission carried out by the Swedish National Testing and Research Laboratory. The annual doses of measured potentially genotoxic components (PAH, formaldehyde, benzene, ethylene, propylene, butadiene) in different residential areas were estimated by means of a dispersion model. The total cancer morbidity risks in areas with free standing homes is estimated to amount to 30 and 100 cases per million and year in South and North Sweden resp. with 'direct firing' of the boilers. The emissions are reduced by a factor of about 10 by firing at maximum heat load ('accumulator firing'), particularly with new boiler constructions operated to give low tar emissions. The risk estimates, based on available epidemiological and dosimetric data, are judged to be uncertain by a factor of about 8. They indicate, however, that pollution from wood combustion cannot be ignored as a risk factor. Particularly, this concerns butadiene which is emitted in relatively large amounts and causes some 50% of the summed-up risks. Among other things this shows the importance of obtaining a more reliable risk estimation of butadiene. 32 refs, 7 tabs

10 SYNTHETIC FUELS

1002 Production

Refer also to citation(s) 14714, 14715, 14716

15264 (DOE/MC/27115–4010) **Direct methane conversion to methanol. Annual report, October 1993–September 1994.** Noble, R.D.; Falconer, J.L. Colorado Univ., Boulder, CO (United States). Dept. of Chemical Engineering. Jan 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-90MC27115. Order Number DE95000082. Source: OSTI; NTIS; GPO Dep.

We proposed to demonstrate the effectiveness of a catalytic membrane reactor (a ceramic membrane combined with a catalyst) to selectively produce methanol by partial oxidation of methane. Methanol is used as a chemical feedstock, gasoline additive, and turbine fuel. Methane partial oxidation using a catalytic membrane reactor has been determined as one of the promising approaches for methanol synthesis from methane. In the original proposal, the membrane was used to selectively remove methanol from the reaction zone before carbon oxides form, thus increasing the methanol yield. Methanol synthesis and separation in one step would also make methane more valuable for producing chemicals and fuels. However, all the membranes tested in this laboratory lost their selectivity under the reaction conditions. A modified non-isothermal, non-permselective membrane reactor then was built and satisfactory results were obtained. The conversion and selectivity data obtained in this laboratory were better than that of the most published studies.

15265 (DOE/PC/90018–T8) **Development of alternative fuels from coal-derived syngas. Quarterly status report No. 9, October 1, 1992–December 31, 1992.** Air Products and Chemicals, Inc., Allentown, PA (United States). [1995]. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90018. Order Number DE95010397. Source: OSTI; NTIS; GPO Dep.

The overall objectives of this program are to investigate potential technologies for the conversion of coal-derived synthesis gas to oxygenated fuels, hydrocarbon fuels, fuel intermediates, and octane enhancers; and to demonstrate the most promising technologies at DOE's LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will initially involve a continuation of the work performed under the Liquid Phase Methanol Program but will later draw upon information and technologies generated in current and future DOE-funded contracts, as well as test commercially available catalysts.

15266 (DOE/PC/90018–T9) **Development of alternative fuels from coal-derived syngas. Quarterly status report No. 10, January 1, 1993–March 31, 1993.** Air Products and Chemicals, Inc., Allentown, PA (United States). [1995]. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90018. Order Number DE95010399. Source: OSTI; NTIS; GPO Dep.

The overall objectives of this program are to investigate potential technologies for the conversion of coal-derived synthesis gas to oxygenated fuels, hydrocarbon fuels, fuel intermediates, and octane enhancers; and to demonstrate the most promising technologies at DOE's LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will initially involve a continuation of the work performed under the Liquid Phase Methanol Program but will later draw upon information and technologies generated in current and future DOE-funded contracts, as well as test commercially available catalysts.

15267 (DOE/PC/90018–T10) **Development of alternative fuels from coal-derived syngas. Quarterly status report No. 7, April 1, 1992–June 30, 1992.** Air Products and Chemicals, Inc., Allentown, PA (United States). [1995]. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90018. Order Number DE95010398. Source: OSTI; NTIS; GPO Dep.

The overall objectives of this program are to investigate potential technologies for the conversion of coal-derived synthesis gas to oxygenated fuels, hydrocarbon fuels, fuel intermediates, and octane enhancers; and to demonstrate the most promising technologies at DOE's LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will initially involve a continuation of the work performed under the Liquid Phase Methanol Program but will later draw upon information and technologies generated in current and future DOE-funded contracts, as well as test commercially available catalysts.

15268 (DOE/PC/90042–T11) **Development of a catalyst for conversion of syngas-derived materials to isobutylene. Quarterly technical report No. 12, January 1, 1994–March 31, 1994.** Barger, P.T. UOP, Inc., Des Plaines, IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90042. Order Number DE95009358. Source: OSTI; NTIS; GPO Dep.

The goals of this project are to develop a catalyst and process for the conversion of syngas to isobutanol. The research will identify and optimize key catalyst and process characteristics. In addition, the commercial potential of the new process will be evaluated by an economic analysis. This report describes pilot plant testing using a 10/1 methanol/ethanol feed blend to identify potential catalysts for the conversion of lower alcohols derived from synthesis gas to isobutanol and other C_{4+} oxygenates. The previous work in this project found that a typical Cu/Zn/Al oxide methanol synthesis catalyst is capable of producing isobutanol and isobutryaldehyde from a feed consisting of a blend of methanol and ethanol. Best performance was obtained at moderate temperature (300 °C) and low pressure (30 psig). This report describes the results of space velocity testing with this catalyst to elucidate the reaction pathway. It has been found that at high ethanol conversion levels (low space velocities), yields of isobutanol and other C_{4+} oxygenates do not increase with increasing methanol conversion. This suggests that Cu/Zn/Al oxide is not active for the condensation of methanol alone to higher alcohols. Therefore, new catalyst formulations are being evaluated for this reaction using the Cu/Zn/Al oxide performance as a baseline. Promising materials will also be examined at high ethanol conversion levels and with a methanol only feed to determine their capability to condense methanol.

15269 (DOE/PC/90042–T12) **Development of a catalyst for conversion of syngas-derived materials to isobutylene. Quarterly technical report No. 13, April 1, 1994–June 30, 1994.**

Barger, P.T. UOP, Inc., Des Plaines, IL (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90042. Order Number DE95009359. Source: OSTI; NTIS; GPO Dep.

The goals of this project are to develop a catalyst and process for the conversion of syngas to isobutanol. The research will identify and optimize key catalyst and process characteristics. In addition, the commercial potential of the new process will be evaluated by an economic analysis. This report describes the preparation and testing of a variety of potential higher alcohols synthesis catalysts based on a bifunctional formulation consisting of a noble metal dehydrogenation function on a basic mixed metal oxide support. A pilot plant catalyst screening test using a 10/1 methanol/ethanol feed blend has been used to identify a new class of catalysts that afford higher selectivities and productivities. of the desired isobutanol and other C_{4+}, products than the Cu/Zn/Al oxide methanol synthesis catalyst that is being used as a baseline for this work. 2% Pd or Pt on a Zn/Mn/Zr oxide support and 2% Pd on a Zn/Mn/Cr support have given the best performances to date. In addition to isobutanol, these catalysts afford significant quantities of isobutyraldehyde and methyl isobutyrate. In order to elucidate the reaction pathway occurring with this class of catalyst, the 2%Pd on Zn/Mn/Zr oxide catalyst has been evaluated over a range of space velocities. It has been found that isobutanol and higher oxygenates yields increase with decreasing space velocity at ethanol conversions greater than 90%. This suggests that this catalyst is capable of converting methanol alone to higher alcohols. This is different from the result obtained with the Cu/Zn/Al oxide baseline catalyst, which showed no change in product yields at high ethanol conversions. Therefore, further effort will be focussed on the development of these noble metal/basic metal oxide catalysts for this application.

15270 (DOE/PC/90042–T13) **Development of a catalyst for conversion of syngas-derived materials to isobutylene. Quarterly report No. 14, July 1, 1994–September 30, 1994.** Barger, P.T.; Kurek, P.R. UOP, Inc., Des Plaines, IL (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90042. Order Number DE95009360. Source: OSTI; NTIS; GPO Dep.

The goals of this project are to develop a catalyst and process for the conversion of syngas to isobutanol. The research will identify and optimize key catalyst and process characteristics. In addition, the commercial potential of the new process will be evaluated by an economic analysis. Previous work had identified Pt and Pd on Zn/Mn/Zr oxide and Pd on Zn/Mn/Cr oxide as promising catalysts for the conversion of a 10/1 methanol/ethanol blend to higher oxygenates. The reproducibility of these catalyst preparations has been found to be generally good, although some variations in performance have been observed between the Pd containing samples. Further characterization of the catalysts showing performance differences is in progress to determine whether compositional variations can account for the discrepancies. Several new 2% Pt on metal oxide catalysts have been prepared and tested. None of these materials performed better than the original 2% Pt on Zn/Mn/Zr (34/34/32 molar) oxide catalyst. However, a lower Zr content support (45/45/10 Zn/Mn/Zr oxide) gave similar results. Evaluation of the 2% Pd on Zn/Mn/Cr oxide at high space velocities has indicated that this material may be substantially less active for the $C_1 - C_1$, condensation step necessary for methanol only conversion to higher alcohols. In view of this finding, subsequent research will focus on the development of the Zn/Mn/Zr oxide support. A variety of alternative catalyst formulations have also been prepared and tested, but have failed to match the performance of noble metal on mixed metal oxide catalysts. These materials have include Cu and Mo on TiO_2, Mg/Al MOSS and polyvinylpyridine and commercial and laboratory prepared Mn oxide samples.

15271 (DOE/PC/91034–T10) **The economical production of alcohol fuels from coal-derived synthesis gas. Quarterly technical progress report number 12, July 1–September 30, 1994.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91034. Order Number DE95009363. Source: OSTI; NTIS; GPO Dep.

Both plug-flow microreactor systems at WVU are now functioning. Screening runs on these systems were started using carbide and nitride catalysts first, to avoid any question of contamination of the system with sulfur. The carbide and nitride catalysts are characterized by high activity but low selectivity towards alcohols. The Chevrel-phase catalysts tested have much lower activities but may be more selective to alcohols. Catalyst synthesis procedures are attempting to offset this tendency, and also to characterize and prepare sulfide catalyst by other approaches. At UCC and P, test runs on the reactor system have commenced. Higher alcohols up to butanol were observed and identified at high temperatures. Modeling studies have concentrated on the catalytic membrane reactor. The topical report, originally submitted last quarter, was revised after some errors were found. This report includes the design and economics for the seven cases discussed in previous quarterly reports. In the topical report, it is shown that a judicious choice of coal:natural gas feed ratio to the alcohol synthesis process allows the Shell Gasifier to be nearly competitive with natural gas priced at of $3.00/MMBtu. The advantage of the Shell Gasifier over the Texaco Gasifier is that the former produces a syngas with a lower H_2:CO ratio. When the feed to the process is coal only, there is no difference in the projected economics that would favor one gasifier over the other. The potential of co-generation of electric power with high alcohol fuel additives has been investigated. Preliminary results have revealed that a once-through alcohol synthesis process with minimal gas clean-up may provide an attractive alternative to current designs given the prevailing economic status of IGCC units.

15272 (DOE/PC/91034–T11) **The economical production of alcohol fuels from coal-derived synthesis gas. Quarterly technical progress report number 13, October 1–December 31, 1994.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Jan 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91034. Order Number DE95009365. Source: OSTI; NTIS; GPO Dep.

At WVU, Mo_2S_3 was produced from gas-phase reactions at 1,100 C. The gas-phase reactor was modified to increase product yields and to decrease particle size. Four Chevrel phases were synthesized for catalytic evaluation. In addition, four supported alkali-modified MoS_2 materials were prepared from a single-source precursor, $K_2Mo_3S_{13}$. Screening runs have been carried out on some of these materials and others prepared earlier. At UCC and P, test runs on the reactor system have commenced. Higher alcohols up to butanol were observed and identified at high temperatures. Significant progress has been made on the Monte Carlo uncertainty analysis. Frequency distributions have been determined for all of the equipment blocks for the Texaco gasifier cases. For these cases, there is a 10% chance that the actual installed capital cost could exceed the estimated installed capital cost by $40 million dollars. This work will continue with inclusion of variable costs and prediction of the uncertainties in the return on investment. Modifications to the simulated annealing optimization program have been underway in order to increase the level of certainty that the final result is near the global optimum. Alternative design cases have been examined in efforts to enhance the economics of the production of high alcohols. One such process may be the generation of electric power using combustion turbines fueled by synthesis gas.

15273 (DOE/PC/92110–T7) **Development of vanadium-phosphate catalysts for methanol production by selective oxidation of methane. Quarterly technical progress report No. 6, July–Septembedr 1994.** McCormick, R.L. Colorado School of Mines, Golden, CO (United States). 10 Jan 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92110. Order Number DE95009645. Source: OSTI; NTIS; GPO Dep.

This is the eighth quarterly technical progress report. During this quarter the project was initiated, after transfer via a novation agreement, at the Colorado School of Mines. Project initiation activities have included: set up of catalyst synthesis apparatus; training on x-ray diffraction and FTIR apparatus; set up of catalyst testing reactor; set up of reactor product analytical systems; and Sst up and method development for measuring catalyst acidity via FTIR. At the end of this quarter significant progress had been made towards completion of these initiation activities. Several

catalyst syntheses have been performed and the catalysts characterized by x-ray diffraction and FTIR. The catalyst testing reactor system is operational. Reactor product analysis system is nearing completion. Initiation of this system was delayed by the unavailability of a Valco valve which has just recently arrived. Set up of the in-situ FTIR cell for catalyst acidity studies has begun. In this report the results of several catalyst syntheses are reported along with characterization results. In particular, impregnation of vanadyl pyrophosphate with potassim nitrate dramatically reduced the number of surface hydroxyl groups. Such groups may be important in the non-selective, total oxidation of hydrocarbons. Also, preliminary experimental results on FTIR spectra of adsorbed pyridine are presented. It is shown that pyridine adsorbed on the catalyst surface can be easily observed by the diffuse reflectance IR technique. We plan to apply this technique to measurement of the acid site strength of surfaces modified with promoters.

15274 (DOE/PC/92111–T8) **Conversion of light hydrocarbon gases to metal carbides for production of liquid fuels and chemicals. Quarterly technical status report, October 1, 1994–December 31, 1994.** Diaz, A.F.; Modestino, A.J.; Pride, J.D.; Howard, J.B.; Tester, J.W.; Peters, W.A. Massachusetts Inst. of Tech., Cambridge, MA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92111. (FE-MIT–92111-9). Order Number DE95009366. Source: OSTI; NTIS; GPO Dep.

Scoping runs with up to 0.125 cfm methane in 1 cfm (ambient temperature) of argon and 12g/min of MgO were performed in October using a graphite anode and tungsten cathode in the new plasma reactor. A GC analysis of the gas sample from the cooling chamber and of the head space gas above the hydrolyzed solid sample revealed the presence of C_3H_4 and C_2H_2, which suggests the formation of magnesium carbide. However, a similar run performed with MgO feeding into a pure argon plasma gave similar results, indicating possible reaction of the graphite electrode with the MgO to form carbides and/or direct formation of C_3H_4 and C_2H_2 in the arc. A GC analysis of the gas sample taken from the cooling chamber from a run in an argon plasma without MgO feeding did no yield any C_3H_4 and C_2H_2, suggesting that the MgO powder is hydrated and is a probable hydrogen source. Thus far, the main obstacle to performing a 100% methane/MgO scoping run is the instability of the methane plasma. Two approaches are being taken to address this issue: increasing the open circuit voltage of the power supply to permit operation of an arc at higher voltage levels and magnetically rotating the arc with a solenoid around the plasma reactor. The latter approach is currently being pursued.

15275 (DOE/PC/92113–T6) **Methane coupling by membrane reactor. Quarterly technical progress report, June 25, 1994–September 24, 1994.** Ma, Yi Hua. Worcester Polytechnic Inst., MA (United States). 4 Jan 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92113. Order Number DE95009642. Source: OSTI; NTIS; GPO Dep.

This quarterly report describes results from the experimental studies on oxidative coupling of methane, oxygen conducting perovskite dense membrane synthesis and modeling studies of the methane coupling reaction. The focus of the experimental study is to explore the effects of varying catalyst loading, varying methane to oxygen ratios and feed conditions when the oxygen conversion is much less than 100%. Results from these studies help in understanding the effects of various parameters controlling methane coupling. Dense membrane synthesis and characterization results are presented which describe new approaches to the synthesis and characterization of these membranes. The modeling results described in this report present a theoretical fit to the experimental data on oxidative coupling of methane in fixed bed reactors. The parameters from the fit are used to predict the trends in experimental data obtained from VYCOR membrane reactors. The predicted trends are based on a theoretical model employing simplified methane coupling kinetics.

15276 (DOE/PC/94066–T1) **Isobutanol-methanol mixtures from synthesis gas. Quarterly technical progress report, 1 October–31 December 1994.** Iglesia, E. California Univ., Berkeley, CA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-94PC94066. Order Number DE95010620. Source: OSTI; NTIS; GPO Dep.

Objective was to design a catalyst for synthesizing isobutanol with a productivity of 200 g isoalcohols/g-cat-h and a molar isobutanol/methanol ratio near unity, and to develop structure-function rules for designing catalyst for selective conversion of synthesis gas to isoalcohols. Activities during this period are reported; equipment reported include controlled pH precipitation unit, catalytic microreactor, and temperature programmed surface reaction/infrared unit.

13 HYDRO ENERGY

1301 Resources and Availability

15277 (DOE/BP–95009167) **Annual report of the Columbia River Treaty, Canada and United States Entities, 1 October 1993–30 September 1994.** USDOE Bonneville Power Administration, Portland, OR (United States). Nov 1994. 58p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009167. Source: OSTI; NTIS; GPO Dep.

The report describes the operation of Mica, Arrow, Duncan, and Libby reservoirs for the 1994 Water Year, 1 Oct 1993 through 30 Sept 1994, with additional information covering the reservoir system operating year, 1 August 1993 through 31 July 1994. The report is divided into: introduction, treaty organization, operating arrangements, weather and streamflow, reservoir operation, and power and flood control accomplishments.

15278 (NYSERDA–95-6) **Niagara Falls Wastewater Treatment Plant outfall hydropower feasibility study. Final report.** New York State Energy Research and Development Authority, New York, NY (United States); Niagara Falls Waste Water Treatment Plant, NY (United States). Jan 1995. 199p. Sponsored by New York State Energy Research and Development Authority, Albany, NY (United States). Source: OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223 (United States).

A feasibility study was conducted to examine the technical and economic merit of constructing what could be the largest hydropower generation facility using treated wastewater effluent in New York State. The impetus of the study was to take advantage of the nearly 200-foot elevation change from the Niagara Falls wastewater treatment plant site to the discharge at the Lower Niagara River. The proposed project would utilize the existing Adams Tailrace Tunnel, which carries the treated effluent beneath the City of Niagara Falls, New York, 150 to 200 feet below ground level. Potential access to the tunnel is through a series of shafts and abandoned, turn-of-the-century hydropower generation facilities. The study included determining the quantity and quality of flow available for hydropower generation from the wastewater treatment plant and the industrial non-contact cooling water that discharges into the same shaft; determining current electric power consumption and billing rates of potential power usage locations; developing and prescreening various hydropower locations and turbine alternatives; evaluating generated power usage options; performing a technical and economic evaluation of the most feasible alternatives; and developing a preliminary design and estimating project costs of the recommended alternative. The study concluded that a 1,025 KW turbine/generator located at the treatment plant site was the most economically feasible alternative. The proposed facility has an estimated project cost of $4,100,000 and will annually generate an equivalent of approximately $388,000 of hydroelectric power based on current electric rates and 1994 dollars. Over the 40-year expected life of the project, the net present worth of savings was estimated at $9,900,000.

1305 Economic, Industrial and Business Aspects

15279 (INIS-mf–14496) **Hydro energy - a chance for ecology.** Novakova, R. Energoproekt, Sofia (Bulgaria). 1994. 5p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy

problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627079. Source: OSTI; NTIS (US Sales Only); INIS.

A review of the present status and perspectives of hydroelectric power plants (HPP) in Bulgaria is presented. The importance of hydro energy for Bulgarian energetics is stressed. The total installed hydro energetic capacity is 1940 MW. The possibility for construction of new large-scale conventional capacities of 2600 MW and some micro HPP of 215 MW is discussed. Some negative impacts of HPP on drying the forests resulting in lowering the water levels are pointed out as well as some financial aspects of the issue. (orig.).

1306 Environmental Aspects

Refer also to citation(s) 15277, 16497

15280 (DOE/BP–17758-2) **Investigations of bull trout (Salvelinus confluentus), steelhead trout (Oncorhynchus mykiss), and spring chinook salmon (O. tshawytscha) interactions in Southeast Washington streams. Final report 1992.** Underwood, K.D.; Martin, S.W.; Schuck, M.L.; Scholz, A.T. Washington State Dept. of Wildlife, Olympia, WA (United States). Jan 1995. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-91BP17758. Order Number DE95009164. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this two year study was to determine if supplementation with hatchery reared steelhead trout (Oncorhynchus mykiss) and spring chinook salmon (O. tshawytscha) negatively impacted wild native bull trout (Salvelinus confluentus) through competitive interactions. Four streams with varying levels of fish supplementation activity were sampled in Southeast Washington. Tasks performed during this study were population density, relative abundance, microhabitat utilization, habitat availability, diet analysis, bull trout spawning ground surveys, radio telemetry of adult bull trout, and growth analysis. Results indicate that bull trout overlapped geographically with the supplemented species in each of the study streams suggesting competition among species was possible. Within a stream, bull trout and the supplemented species utilized dissimilar microhabitats and microhabitat utilization by each species was the same among streams suggesting that there was no shifts in microhabitat utilization among streams. The diet of bull trout and O. mykiss significantly overlapped in each of the study streams. The stream most intensely supplemented contained bull trout with the slowest growth and the non-supplemented stream contained bull trout with the fastest growth. Conversely, the stream most intensely supplemented contain steelhead with the fastest growth and the non-supplemented stream contained steelhead with the slowest growth. Growth indicated that bull trout may have been negatively impacted from supplementation, although other factors may have contributed. At current population levels, and current habitat quantity and quality, no impacts to bull trout as a result of supplementation with hatchery reared steelhead trout and spring chinook salmon were detected. Project limitations and future research recommendations are discussed.

15281 (DOE/BP–92818-3) **Willamette oxygen supplementation studies. Annual progress report.** Ewing, R.D. (Biotech Research and Consulting, Inc., Corvallis, OR (United States)); Ewing, S.K.; Sheahan, J.E. Oregon Dept. of Fish and Wildlife, Portland, OR (United States). Sep 1994. 167p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-88BP92818. Order Number DE95009166. Source: OSTI; NTIS; INIS; GPO Dep.

Hydropower development and operations in the Columbia River basin have caused the loss of 5 million to 11 million salmonids. An interim goal of the Northwest Power Planning Council is to reestablish these historical numbers by doubling the present runs from 2.5 million adult fish to 5.0 million adult fish. This increase in production will be accomplished through comprehensive management of both wild and hatchery fish, but artificial propagation will play a major role in the augmentation process. The current husbandry techniques in existing hatcheries require improvements that may include changes in rearing densities, addition of oxygen, removal of excess nitrogen, and improvement in raceway design. Emphasis will be placed on the ability to increase the number of fish released from hatcheries that survive to return as adults. Rearing density is one of the most important elements in fish culture. Fish culturists have attempted to rear fish in hatchery ponds at densities that most efficiently use the rearing space available. Such efficiency studies require a knowledge of cost of rearing and the return of adults to the fisheries and to the hatchery.

15282 (DOE/EA–0940/1/95) **Hellsgate Winter Range: Wildlife Mitigation Project. Preliminary environmental assessment.** USDOE Bonneville Power Administration, Portland, OR (United States). Jan 1995. 79p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009170. Source: OSTI; NTIS; GPO Dep.

The Bonneville Power Administration proposes funding the Hellsgate Winter Range Wildlife Mitigation Project in cooperation with the Colville Convederated Tribes and Bureau of Indian Affairs. This Preliminary Environmental Assessment examines the potential environmental effects of acquiring and managing property for wildlife and wildlife habitat within a large project area. The Propose action is intended to meet the need for mitigation of wildlife and wild life habitat that was adversely affected by the construction of Grand Coulee and Chief Joseph Dams and their reservoirs.

15283 (DOE/EA–0940/3/95) **Hellsgate Winter Range: Wildlife mitigation project. Final environmental assessment.** USDOE Bonneville Power Administration, Portland, OR (United States); Colville Confederated Tribes, Nespelem, WA (United States); Bureau of Indian Affairs, Washington, DC (United States). Mar 1995. 79p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2552). Order Number DE95009168. Source: OSTI; INIS; NTIS; GPO Dep.

Bonneville Power Administration (BPA) proposes to fund the Hellsgate Winter Range Wildlife Mitigation Project (Project) in a cooperative effort with the Colville Confederated Tribes and the Bureau of Indian Affairs (BIA). The proposed action would allow the sponsors to secure property and conduct wildlife management activities within the boundaries of the Colville Indian Reservation. This Final Environmental Assessment (EA) examines the potential environmental effects of acquiring and managing property for wildlife and wildlife habitat within a large project area. This area consists of several separated land parcels, of which 2,000 hectares (4,943 acres) have been purchased by BPA and an additional 4,640 hectares (11,466 acres) have been identified by the Colville Confederated Tribes for inclusion in the Project. Four proposed activities (habitat protection, habitat enhancement, operation and maintenance, and monitoring and evaluation) are analyzed. The proposed action is intended to meet the need for mitigation of wildlife and wildlife habitat that was adversely affected by the construction of Grand Coulee and Chief Joseph Dams and their reservoirs.

14 SOLAR ENERGY

1403 Economic, Industrial, and Business Aspects

Refer also to citation(s) 15718

15284 (INIS-mf–14487) **Enhancement of heliothermal systems efficiency.** Draganov, B.; Fara, L. Kievskij Politekhnicheskij Inst., Kiev (Ukraine); Institutul Politehnic, Bucharest (Romania). 1994. 4p. (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627080. Source: OSTI; NTIS (US Sales Only); INIS.

An attempt to solve the problem of optimization of economic indicators of a solar system is presented. The three main subsystems are considered: solar collector, thermal accumulator and heat exchanger. The use of eurystic-algorithmic models is proposed to determine the degree of influence of the most important technological and energetic parameters on the extreme values of system efficiency indicators, as well as to take into account the interaction of various subsystems and the optimum of the entire system. As thermal accumulator the underground system is considered, and a mathematical model is proposed for solving the process of heat exchange and mass transfer in rocks, e.g. filtering of the thermal

agent and its thermal shift. The increase in energy efficiency of solar collectors and heat exchangers is achieved by using rubbed tubes. A strong effect on the heat exchange intensification is caused through flow turbulence which could be increased by transverse prominences. The application of exergetic analysis is proposed for estimating the energetic efficiency of the solar installations and their subsystems. 7 refs. (orig.).

15285 (NEDO-P–9327) **Evaluation and analysis survey on new energy introduction. 3.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 235p. (In Japanese). Order Number DE95769806. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A detailed study is made on introduction of the photovoltaic power generation system to Japan. The paper analyzes influences of production learning of the equipment, fund subsidies and overseas export production on wide spread of the photovoltaic power generation system, and clarifies the potential amount of the future introduction. The analysis is conducted by converting learning coefficients of battery cell and inverter to 0.7, 0.8 (standard), and 0.9. The cumulative spread of the system by 2040 will amount to 14,911MW, 819MW (standard), 117MW, respectively. The future introduction amount is analyzed by changing exports of the photovoltaic power generation. The cumulative spread of the system by 2040 will increase up to 2,015MW in case of 6% as against 819MW in standard case of 3%. If changing the rate of fund subsidies to 50% (standard), 67% and 75%, the cumulative spread amount will be 819MW (standard), 6,257MW and 10,173MW, and reduction of CO2 emissions will be 1 million t-c/yr, 2 million t-c/yr and 3 million t-c/yr, respectively. 74 figs., 82 tabs.

1404 Environmental Aspects

15286 (BNL–61501) **Environmental and health aspects of copper-indium-diselenide thin-film photovoltaic modules.** Steinberger, H. (Fraunhofer Inst. for Solid State Technology, Munich (Germany)); Thumm, W.; Freitag, R.; Moskowitz, P.D.; Chapin, R. Brookhaven National Lab., Upton, NY (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9405301–1: 5. international symposium on industrial uses of selenium and tellurium, Brussels (Belgium), 8-11 May 1994). Order Number DE95009018. Source: OSTI; NTIS; INIS; GPO Dep.

Copper-indium-diselenide (CIS) is a semiconductor compound that can be used to produce thin-film photovoltaic modules. There is on-going research being conducted by various federal agencies and private industries to demonstrate the commercial viability of this material. Because this is a new technology, and because scant information about the health and environmental hazards associated with the use of this material is available, studies have been initiated to characterize the environmental mobility and environmental toxicology of this compound. The objective of these studies is to identify the environmental and health hazards associated with the production, use, and disposal of CIS thin-film photovoltaic modules. The program includes both experimental and theoretical components. Theoretical studies are being undertaken to estimate material flows through the environment for a range of production options as well as use and disposal scenarios. The experimental programs characterize the physical, chemical e.g. leachability and biological parameters e.g. EC_{50} in daphnia and algae, and feeding studies in rats.

1405 Solar Energy Conversion

15287 (CRIE-T–93073) **Solar cell array design method for preventing power reduction due to module output fluctuation.** Kobayashi, H. (Central Research Institute of Electric Power Industry, Tokyo (Japan)). Central Research Inst. of Electric Power Industry, Tokyo (Japan). Apr 1994. 29p. (In Japanese). Order Number DE95769745. Source: OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan.

A discussion was given on the method to design solar cell arrays to minimize reduction in power output from the arrays caused by variance in the output characteristics of solar cell modules. Measurements verified that the variance in solar array modules causes the fluctuation coefficient of the output current to reach 5% as a maximum, and the reduction in the solar cell array output power can reach about 6% as a maximum. Using the arrangement and connection methods of the modules as parameters, the array output voltage/current characteristics were analyzed by using a simulation. As a result, it was found that an arrangement in which the module output current becomes uniform in the portions where the modules are connected in series in the array circuit, and a method to divide the arrays into blocks are the effective solution. Thus, when the interior of the solar cell arrays was divided into three to four blocks in the series direction, and the modules were arranged by using a simple method to consider the orders of the module output current values, the reduction in the solar cell array output was suppressed nearly completely. 5 refs., 23 figs., 5 tabs.

15288 (DOE/ER/13791–T2) **Photoinitiated electron transfer in multichromophoric species: Synthetic tetrads and pentads.** Arizona State Univ., Tempe, AZ (United States). Dept. of Chemistry and Biochemistry. Mar 1993. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13791. Order Number DE95009806. Source: OSTI; NTIS; GPO Dep.

This project involves the design, synthesis and study of molecules which mimic some of the important aspects of photosynthetic electron and energy transfer. This research project is leading to a better understanding of the energy conserving steps of photosynthesis via the study of synthetic model systems which abstract features of the natural photosynthetic apparatus. The knowledge gained from these studies will aid in the design of artificial photosynthetic reaction centers which employ the basic chemistry and physics of photosynthesis to help meet mankind's energy needs. The approach to artificial photosynthesis employed in this project is to use synthetic pigments, electron donors, and electron acceptors similar to those found in biological reaction centers, but to replace the protein component with covalent bonds. These chemical linkages determine the electronic coupling between the various moieties by controlling separation, relative orientation and overlap of electronic orbitals. The model systems are designed to mimic the following aspects of natural photosynthetic electron transfer: electron donation from a tetrapyrrole excited single state, electron transfer between tetrapyrroles, electron transfer from tetrapyrroles to quinones, and electron transfer between quinones with different redox properties. In addition, they mimic carotenoid antenna function in photosynthesis (singlet-singlet energy transfer from carotenoid polyenes to chlorophyll) and carotenoid photoprotection from singlet oxygen damage (triplet-triplet energy transfer from chlorophyll to carotenoids).

15289 (DOE/GO–10095-082) **Photovoltaic energy program overview: Fiscal year 1994.** National Renewable Energy Lab., Golden, CO (United States). Mar 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94011871. Source: OSTI; NTIS; GPO Dep.

This is the 1994 overview for the Photovoltaic Energy Program. The topics of this overview include cooperative research projects to improve PV systems and develop pre-commercial prototypes of new PV products, expanding understanding of the fundamental mechanisms governing the formation and performance of PV materials, and helping US industry enhance its leadership position in the PV market.

15290 (LUNKDL-NKVK–95-1005) **Function of minor Chlorophyll a/b-binding protein complexes and regulation of the Xantophyll cycle.** Bratt, C.E. Lund Univ. (Sweden). Dept. of Plant Biochemistry. Mar 1995. 48p. Order Number DE95766673. Source: OSTI; NTIS.

Reconstitution experiments were performed to study the functional role of the chlorophyll protein complex CP29. Photosystem II core preparations and the major light harvesting complex LHCII were incorporated into thylakoid lipids both in the presence and absence of CP29. The energy transfer between the complexes was studied using 77 K fluorescence emission spectroscopy. The results indicated that CP29 facilitates the energy transfer within

photosystem II in the presence of divalent cations. In reconstitution experiments the influence of any detergent present may be an important factor. A method was therefore developed to quantify n-octyl beta-D-glucopyranoside and n-dodecyl beta-D-maltoside content in biological samples using a thin layer chromatography method. In further experiments a copper binding protein was isolated using a fractionation procedure, which included the solubilization of photosystem II particles. The protein was identified as CP26 and was found to have an apparent content of 1 Cu/photosystem II (assuming 250 chlorophylls). EPR measurements suggested oxygen and/or nitrogen as the ligand for the copper. The activity of violaxanthin de-epoxidase was also studied along with its activation by both pH and ascorbate concentration. This enzyme converts violaxanthin to zeaxanthin via the intermediate antheraxanthin in the xanthophyll cycle. Formation of zeaxanthin is believed to protect the plant from excess light by dissipating excess energy. The Km of this enzyme was found to have a strong dependence on pH. This result suggests that the acidic form of ascorbate is the substrate for the enzyme. The release of this enzyme from the thylakoids using sonication was also found to be strongly pH dependent with a cooperativity of 4 with respect to protons. 182 refs, 9 figs

15291 (NEI-DK–1902) **Danish participation in the European Communities concerted actions on PV systems technology and coordination of PV systems development, task 6: Modelling and simulations. Final report.** PA Energy A/S, Malling (Denmark). Feb 1995. 92p. (In Danish, English). Contract ENS-51181-94.0018. Order Number DE95766487. Source: OSTI; NTIS.

The main purpose is to define, develop and test a PC based software complex for simulation, analysis and design of a wide range of solar cell arrays, for instance power net - connected, single and hybrid array systems. ASHLING is a professional software in this field, used in Denmark to simulate the existing Danish solar collector systems with considerable success. Adjustments and modifications of ASHLING make it useful in any country of the world. (EG)

15292 (NREL/TP–411-7497) **Cast polycrystalline silicon photovoltaic module manufacturing technology improvements. Semiannual subcontract report, 8 December 1993–30 June 1994.** Wohlgemuth, J. (Solarex Corp., Frederick, MD (United States)). National Renewable Energy Lab., Golden, CO (United States); Solarex Corp., Frederick, MD (United States). Mar 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004065. Source: OSTI; NTIS; GPO Dep.

This report describes work done under a 3-year program to advance Solarex's cast polycrystalline silicon manufacturing technology, reduce module production cost, increase module performance, and expand Solarex's commercial production capacities. The accomplishments described in this report are as follows: (1) the authors designed modifications to casting stations, ceramic molds, and sizing saws to allow for casting and sizing of larger ingots; (2) they demonstrated the casting of ingots with 17% larger volume; (3) the selected and purchased a new wire saw from HCT Shaping Systems; (4) they demonstrated wafering of eight bricks (2,400 wafers or ~4.4 kilowatts at the cell level) in a 6.5-h run; (5) they demonstrated 14% average cell efficiency in the laboratory using an aluminum paste back surface field; (6) the Automation and Robotics Research Institute (ARRI) completed a modeling study of the Solarex module assembly process; (7) they identified and qualified three new lower-cost back sheet materials through accelerated environmental tests; and (8) they designed and built a test structure for mounting frameless modules, and selected two adhesives and began testing their ability to hold modules to the structure.

15293 (NREL/TP–411-7498) **Photovoltaic Czochralski silicon manufacturing technology improvements. Annual subcontract report, 1 April 1993–31 March 1994.** Jester, T. (Siemens Solar Industries, Camarillo, CA (United States)). National Renewable Energy Lab., Golden, CO (United States); Siemens Solar Industries, Camarillo, CA (United States). Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004066. Source: OSTI; NTIS; GPO Dep.

This report describes work performed under a 3-year, 3-phase, cost-share contract to demonstrate significant cost reductions and improvements in manufacturing technology. The objective of the program is to reduce costs in photovoltaic manufacturing by approximately 10% per year. The work was focused in three main areas: (1) silicon crystal growth and thin wafer technology; (2) silicon cell processing; and (3) silicon module fabrication and environmental, safety, and health issues. During this reporting period, several significant improvements were achieved. The crystal growing operation improved significantly with an increase in growth capacity due to larger crucibles, higher polysilicon packing density, and high pull speeds. Wafer processing with wire saws progressed rapidly, and the operation is completely converted to wire saw wafer processing. The wire saws yield almost 50% more wafers per inch in production, thus improving manufacturing volume by 50% without any additional expense in crystal growth. Cell processing improvements focused on better understanding the contact paste and firing processes. Module designs for lower material and labor costs began with the focus on a new junction box, larger modules with larger cells, and a less costly framing technique. In addition, chlorofluorocarbon (CFC) usage was completely eliminated in the Siemens manufacturing facility during this period, resulting in significant reductions in the cost of caustic waste treatment.

15294 (NREL/TP–411-7682) **Large-area, triple-junction a-Si alloy production scale-up. Semiannual subcontract report, 17 March 1994–18 September 1994.** Oswald, R. (Solarex Corp., Newtown, PA (United States). Thin Film Div.); Morris, J. National Renewable Energy Lab., Golden, CO (United States); Solarex Corp., Newtown, PA (United States). Thin Film Div. Mar 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004067. Source: OSTI; NTIS; GPO Dep.

This report describes work performed under a 3-year subcontract to advance Solarex's photovoltaic (PV) manufacturing technologies, reduce its hydrogenated amorphous silicon (a-Si:H) module production costs, increase module performance, and expand the Solarex commercial production capacity. During the period covered by this report, Solarex focused on (1) improving deposition of the front contact, (2) investigating alternate feed stocks for the front contact, (3) maximizing throughput and area utilization for all laser scribes, (4) optimizing a-Si:H deposition equipment to achieve uniform deposition over large areas, (5) optimizing the triple-junction module fabrication process, (6) evaluating the materials to deposit the rear contact, and (7) optimizing the combination of isolation scribe and encapsulant to pass the wet high-potential test.

15295 (NREL/TP–411-7695) **Comprehensive research on the stability and electronic properties of a-Si:H and a-SiGe:H alloys and devices. Final subcontract report, 10 March 1991–30 August 1994.** Dalal, V. (Iowa State Univ. of Science and Technology, Ames, IA (United States)). National Renewable Energy Lab., Golden, CO (United States); Iowa State Univ. of Science and Technology, Ames, IA (United States). Apr 1995. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004088. Source: OSTI; NTIS; GPO Dep.

This report describes work on the growth of a-Si:H and a-(Si,Ge):H materials and devices using well-controlled growth techniques. The a-Si:H materials were grown at higher temperatures (300°-375°C) using electron-cyclotron-resonance (ECR) plasma techniques with a remote H beam. These films have excellent electronic quality and show significant improvements in stability compared with glow-discharge-produced a-Si:H materials. Several problems were encountered during the fabrication of devices in these materials, and we were able to overcome them by a systematic work on buffer layers in these cells. We also studied alternative designs for improving the stability of a-Si:H cells and produced graded-gap a-Si:H cells using glow-discharge that are more stable than comparable standard, ungraded glow discharge devices. Finally, systematic work was done to produce good-quality a-(Si,Ge):H films, using triode radio frequency (RF) glow-discharge with ion bombardment during growth. Diagnostic devices were made using these films, and the properties of the material, such as

Urbach energies and hole mobility-lifetime products, were measured in these devices. We found a systematic increase in the Urbach energies, and a corresponding decrease in the hole and electron $\mu\tau$ products, as the Ge content of the alloys increases.

15296 (NREL/TP–412-7680) **Photovoltaic module certification/laboratory accreditation criteria development.** Osterwald, C.R. (National Renewable Energy Lab., Golden, CO (United States)); Hammond, R.L.; Wood, B.D.; Backus, C.E.; Sears, R.L.; Zerlaut, G.A.; D'Aiello, R.V. National Renewable Energy Lab., Golden, CO (United States). Apr 1995. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004063. Source: OSTI; NTIS; GPO Dep.

This document provides an overview of the structure and function of typical product certification/laboratory accreditation programs. The overview is followed by a model program which could serve as the basis for a photovoltaic (PV) module certification/laboratory accreditation program. The model covers quality assurance procedures for the testing laboratory and manufacturer, third-party certification and labeling, and testing requirements (performance and reliability). A 30-member Criteria Development Committee was established to guide, review, and reach a majority consensus regarding criteria for a PV certification/laboratory accreditation program. Committee members represented PV manufacturers, end users, standards and codes organizations, and testing laboratories.

15297 (NREL/TP–413-7684) **Investigation of polycrystalline thin film $CuInSe_2$ solar cells based on ZnSe windows. Annual subcontract report, 15 February, 1993–14 February, 1994.** Olsen, L.C. (Washington State Univ., Richland, WA (United States)). National Renewable Energy Lab., Golden, CO (United States); Washington State Univ., Richland, WA (United States). Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004068. Source: OSTI; NTIS; GPO Dep.

This report concerns studies of CIS solar cells based on ZnSe window layers. ZnSe/CIS devices are fabricated by growing ZnSe films by MOCVD onto Siemens CIS and graded absorber substrates. ZnSe films are grown by reacting H_2Se with a zinc adduct. ZnSe/CIS heterojunctions have been studied by depositing transparent aluminum contacts onto ZnSe. These studies indicate that ZnSe/CIS solar cells can be fabricated with an efficiency greater than 14%. Open circuit voltages are typically larger than 500 mV and the optimum range of ZnSe film thickness for maximum efficiency is between 100 Å and 250 Å. Photocurrents are significantly reduced as the film thickness exceeds 250 Å. Photoluminescence spectroscopy has been utilized to characterize the physical nature of CIS substrate surfaces, and ZnSe-CIS interfaces. These studies indicate that a segregated phase(s) exists at the surface of as received Siemens substrates. Additionally, it is determined that the segregated phase(s) still exist after the ZnSe growth process. To date, sputtered ZnO top contact layers have caused degradation of the photovoltaic properties of the ZnSe/CIS structure. Investigations of the effects of MOCVD grown ZnO upon ZnSe/CIS structures will soon be initiated. To establish the feasibility of ZnSe as a window layer, cells have been fabricated by incorporating a protective layer of CdS between the ZnSe and ZnO. A total area efficiency of 11% was obtained with such a structure.

15298 (NREL/TP–413-7702) **Development of large-area monolithically integrated silicon-film™ photovoltaic modules. Final subcontract report, May 1, 1991–December 31, 1994.** Hall, R.B. (AstroPower, Inc., Newark, DE (United States)); Rand, J.A.; Cotter, J.E. Radiation Systems, Inc., Cleveland, TN (United States). Apr 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004089. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to develop Silicon Film™ Product III into a low-cost, stable solar cell for large-scale terrestrial power applications. The Product III structure is a thin (<100 μm) polycrystalline layer of silicon on a durable, insulating, ceramic substrate. The insulating substrate allows the silicon layer to be isolated and metallized to form a monolithically interconnected array of solar cells. High efficiency is achieved by the use of light trapping and passivated surfaces. This project focused on the development of five key technologies associated with the monolithic sub-module device structure: (1) development of the film deposition and growth processes; (2) development of the low-cost ceramic substrate; (3) development of a metallurgical barrier technology; (4) development of sub-element solar cell processing techniques; and (5) development of sub-module (isolation and interconnection) processes. This report covers the development approaches and results relating to these technologies. Significant progress has been made in the development of all of the related technologies. This is evidenced by the fabrication of a working 12.0 cm^2 prototype sub-module consisting of 7 elements and testing with an open circuit voltage of 3.9 volts, a short circuit current of 35.2 mA and a fill factor of 63% and an overall efficiency of 7.3%. Another significant result achieved is a 13.4% (NREL verified), 1.0 cm^2 solar cell fabricated from material deposited and grown on a graphite cloth substrate. The significant technological hurdle of the program was and remains the low quality of the photovoltaic layer which is caused by contamination of the photovoltaic layer from the low-cost ceramic substrate by trace impurities found in the substrate precursor materials. The ceramic substrate and metallurgical barrier are being developed specifically to solve this problem.

1406 Photovoltaic Power Systems

Refer also to citation(s) 15285, 15289, 15613, 15752

15299 (ETDE-DE–82) **Risk minimisation by means of preliminary laboratory tests, illustrated by the example of the TUEV-PV laboratory. Lecture presented to the seminar: Chances and risks of renewable energy sources.** Wiesner, W. Technischer Ueberwachungs-Verein Rheinland e.V. (TUeV), Koeln (Germany). Inst. fuer Energietechnik und Umweltschutz. [1992]. 16p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03E8618A. Order Number DE95770353. Source: OSTI; NTIS (US Sales Only).

With a detailed catalogue of rules and its current application, safety of electric facilities is possible in spite of the hazards of electric power. The particular requirements of the construction of photovoltaic systems are listed, test methods are explained, and problems concerning the social and environmental acceptability of photovoltaic energy conversion are discussed. (BBR)

15300 (NEDO-NP–9322) **Investigation research on introducing new energy technology, promoting its practical application, and providing its instruction.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 303p. (In Japanese). Order Number DE95769801. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

For the purpose of smoothly expediting concrete introduction and utilization of new energy technology, the paper investigates and analyzes various kinds of information, and at the same time studies construction of a system to assist giving smooth technical guidance and consultation. Data are arranged on the insolation amount, mean temperature, maximum/minimum temperature collected from 67 weather observatories in Japan. Calculation is made on the insolation amount, and the generated output which is supposed from the latitude angle and the inclination angle of solar cell modules. Examples of introducing the photovoltaic power generation system, including NEDO, are pigeonholed and classified. There are many restrictive conditions at the time of introduction of the photovoltaic power generation. Relations between kinds of places where the technology is introduced and the related legal system are studied. In case of interconnecting to the power system as on-site power generation facilities, the technology should meet requirements of technology of the system interconnection, and therefore study items and equipment policy in case of low-/high-pressure interconnection are arranged. The assistance system is constructed by databasing the data collected, pigeonholed, and analyzed such above. 27 refs., 49 figs., 34 tabs.

15301 (NREL/TP–472-7851) **Building-integrated photovoltaics.** National Renewable Energy Lab., Golden, CO (United States); Kiss Cathcart Anders Architects, New York, NY (United States). Jan 1993. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004056. Source: OSTI; NTIS; GPO Dep.

This is a study of the issues and opportunities for building-integrated PV products, seen primarily from the perspective of the design community. Although some quantitative analysis is included, and limited interviews are used, the essence of the study is qualitative and subjective. It is intended as an aid to policy makers and members of the technical community in planning and setting priorities for further study and product development. It is important to remember that the success of a product in the building market is not only dependent upon its economic value; the diverse group of building owners, managers, regulators, designers, tenants and users must also find it practical, aesthetically appealing and safe. The report is divided into 11 sections. A discussion of technical and planning considerations is followed by illustrative diagrams of different wall and roof assemblies representing a range of possible PV-integration schemes. Following the diagrams, several of these assemblies are then applied to a conceptual test building which is analyzed for PV performance. Finally, a discussion of mechanical/electrical building products incorporating PVs is followed by a brief surveys of cost issues, market potential and code implications. The scope of this report is such that most of the discussion does not go beyond stating the questions. A more detailed analysis will be necessary to establish the true costs and benefits PVs may provide to buildings, taking into account PV power revenue, construction costs, and hidden costs and benefits to building utility and marketability.

1407 Solar Thermal Power Systems

15302 (DOE/GO–10095-085) **Solar thermal electric: Program overview fiscal years 1993–1994.** National Renewable Energy Lab., Golden, CO (United States). Mar 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94000240. Source: OSTI; NTIS; GPO Dep.

The Solar Thermal Electric Program Overview and Accomplishments for Fiscal Years 1993–1994 are documented.

15303 (SAND–94-0785) **Optical performance of the TBC-2 solar collector before and after the 1993 mirror lustering.** Houser, R. (Sandia National Labs., Albuquerque, NM (United States). Solar Thermal Test Dept.); Strachan, J. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95008524. Source: OSTI; NTIS; GPO Dep.

In 1993, the mirror facets of one of Sandia's point-focusing solar collectors, the Test Bed Concentrator #2 (TBC-2), were reconditioned. The concentrator's optical performance was evaluated before and after this operation. This report summarizes and compares the results of these tests. The tests demonstrated that the concentrator's total power and peak flux were increased while the overall flux distribution in the focal plane remained qualitatively the same.

15304 (SAND–94-2525) **Results of molten salt panel and component experiments for solar central receivers: Cold fill, freeze/thaw, thermal cycling and shock, and instrumentation tests.** Pacheco, J.E.; Ralph, M.E.; Chavez, J.M.; Dunkin, S.R.; Rush, E.E.; Ghanbari, C.M.; Matthews, M.W. Sandia National Labs., Albuquerque, NM (United States). Jan 1995. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009085. Source: OSTI; NTIS; GPO Dep.

Experiments have been conducted with a molten salt loop at Sandia National Laboratories in Albuquerque, NM to resolve issues associated with the operation of the 10MW_e Solar Two Central Receiver Power Plant located near Barstow, CA. The salt loop contained two receiver panels, components such as flanges and a check valve, vortex shedding and ultrasonic flow meters, and an impedance pressure transducer. Tests were conducted on procedures for filling and thawing a panel, and assessing components and instrumentation in a molten salt environment. Four categories of experiments were conducted: (1) cold filling procedures, (2) freeze/thaw procedures, (3) component tests, and (4) instrumentation tests. Cold-panel and -piping fill experiments are described, in which the panels and piping were preheated to temperatures below the salt freezing point prior to initiating flow, to determine the feasibility of cold filling the receiver and piping. The transient thermal response was measured, and heat transfer coefficients and transient stresses were calculated from the data. Freeze/thaw experiments were conducted with the panels, in which the salt was intentionally allowed to freeze in the receiver tubes, then thawed with heliostat beams. Slow thermal cycling tests were conducted to measure both how well various designs of flanges (e.g., tapered flanges or clamp type flanges) hold a seal under thermal conditions typical of nightly shut down, and the practicality of using these flanges on high maintenance components. In addition, the flanges were thermally shocked to simulate cold starting the system. Instrumentation such as vortex shedding and ultrasonic flow meters were tested alongside each other, and compared with flow measurements from calibration tanks in the flow loop.

15305 (SAND–94-8235) **NaK pool-boiler solar receiver durability bench test. Volume 2, Metallurgical analysis.** Goods, S.H. (Sandia National Labs., Livermore, CA (United States)); Bradshaw, R.W. Sandia National Labs., Livermore, CA (United States). Jan 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010338. Source: OSTI; NTIS; GPO Dep.

The principal materials used in the construction of a NaKbased pool-boiler were analyzed. The device, operated for 7500 hours, accumulated 1000 thermal cycles to a peak temperature of 750°C. Haynes 230, used to fabricate the pool-boiler vessel, was found to perform satisfactorily. Air-side corrosion of the pool-boiler vessel was insignificant. Internal surface of the alloy exhibited some NaK-induced elemental dissolution; this dissolution was somewhat more extensive where the alloy was exposed to the liquid metal compared to regions exposed only to NaK vapor; however, the corresponding metal loss in all regions was inconsequential, never exceeding more than a few microns. Autogenous seam welds of the alloy responded in a similar fashion, exhibiting only minimal metal loss over the course of the experiment. While there was 50% loss in ductility of the alloy there remained adequate ductility for the anticipated operating environment. An enhanced boiling nucleation surface comprised of stainless steel powder brazed to the vessel ID showed no change in its structure. It remained intact, showing no cracking after repeated thermal cycling. Other materials used in the experiment showed more extensive degradation after exposure to the NaK. IN 600, used to fabricate thermowells, exhibited extensive surface and intergranular dissolution. Grain boundary dissolution was sufficiently severe in one of the thermowells to cause an air leak, resulting in experiment termination. BNi-3, a brazing alloy used to join the pool-boiler vessel, endcaps and thermowells, showed some dissolution where it was exposed to the NaK as well as thermal aging effects. However, all brazes remained structurally sound. A nickel metal ribbon showed catastrophic dissolution, resulting in the formation of deep (> 30 μm) pits and cavities. A zirconium metal foil used to getter oxygen from the NaK became extremely brittle.

1409 Solar Thermal Utilization

15306 (CONF-940326–10) **Modification of the aborption cycle for low generator firing temperatures.** Thornbloom, M.D.; Nimmo, B.G. Florida Solar Energy Center, Cape Canaveral, FL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC36-86SF16305. From ASME/JSME/JSES international solar energy conference; San Francisco, CA (United States); 27-30 Mar 1994. Order Number DE95010270. Source: OSTI; NTIS; GPO Dep.

Analysis of a solar/electric hybrid absorption cooling system using lithium bromide and water is presented. Addition of a compressor between the evaporator and the absorber allows the system to maintain system capacity in spite of lower generator firing

temperatures provided by flat plate collectors. With the compressor added, the evaporator maintains design pressure and temperature, but increased pressure in the absorber shifts the equilibrium concentration, increasing the amount of refrigerant absorbed. Thus, the solution enters the generator at a more dilute concentration than the case without the compressor. Preliminary analysis shows that less than 250 W to the compressor is needed to increase capacity to 3.52 kW (one ton) from 0.81 kW for typical operating conditions. The system coefficient of performance also increases, and reaches an optimum as compressor power increases. Other compressor issues such as leakage and impeller design are discussed. This design modification improves the feasibility of absorption cooling for use with standard low temperature flat plate collectors.

15307 (DOE/GO–10095-125) **The Department of Energy's Solar Industrial Program: 1994 review.** National Renewable Energy Lab., Golden, CO (United States). Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95004025. Source: OSTI; NTIS; GPO Dep.

This is a report on DOE's Solar Industrial Program. The topics of the report include an overview of the program, it's participants and it's objectives; solar detoxification–using solar energy to destroy environmental contaminants in air, water, and soil; solar process heat–generating industrial quantities of hot water, steam, and hot air from solar energy; and advanced processes–using concentrated solar energy to manufacture high-technology materials and develop new industrial processes.

15308 (DOE/SF/16305–T1) **Open cycle liquid desiccant dehumidifier and hybrid solar/electric absorption refrigeration system. Annual report, January 1993–December 1993. Calendar year 1993.** Nimmo, B.G.; Thornbloom, M.D. Florida Solar Energy Center, Cape Canaveral, FL (United States). [1995]. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC36-86SF16305. (FSEC-CR–713-94). Order Number DE95010172. Source: OSTI; NTIS; GPO Dep.

This annual report presents work performed during calendar year 1993 by the Florida Solar Energy Center under contract to the US Department of Energy. Two distinctively different solar powered indoor climate control systems were analyzed: the open cycle liquid desiccant dehumidifier, and an improved efficiency absorption system which may be fired by flat plate solar collectors. Both tasks represent new directions relative to prior FSEC research in Solar Cooling and Dehumidification.

15309 (DOE/SF/16306–46) **Colorado State University Program for developing, testing, evaluating and optimizing solar heating systems. Project status report for the months of February and March 1995.** Colorado State Univ., Fort Collins, CO (United States). Solar Energy Applications Lab. Apr 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG36-86SF16306. Order Number DE95010486. Source: OSTI; NTIS; GPO Dep.

The current work has been to improve the TRNSYS model temperature and energy predictions for a previous experimental data set collected using the Solhart 180JK system mounted at CSU's Solar Simulator. A successful systematic approach to adjusting the model is described.

15310 (DTU-LV-MEDD–274) **The design reference year. Users Manual.** Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varmeisolering. Feb 1995. 22p. Contract EM-1213/88-21. (IEA-SHCP–9E-1). Order Number DE95772359. Source: OSTI; NTIS.

EFP-88.

This manual gives a survey of data available in 'Design Reference Years' (DRY) for some locations in Europe. A DRY is a collection of climate data for a given location for one year, arranged as 8760 sets of hourly, simultaneous weather parameters. DRY's are used as input data for computer simulations of the all-year performance of solar energy systems, and of indoor thermal climate and heating and cooling loads of buildings. DRY's contain, as hourly data: Dry bulb and dew point temperature, global, diffuse and direct normal (beam) irradiance, wind speed and direction, cloud information, and some new parameters measured in routine meteorological systems. The general rule has been to include what is available for the location. Among new data are: illuminance, global, diffuse and beam; 5-min values of direct irradiance, for use with active solar systems; weather forecast data, for simulations of 'intelligent' building energy management systems; and longwave sky radiation. Design Reference Years are, compiled from 12 months of measured climate data for a location, in true sequences within each month. After the selection of 12 months and adjustment procedure has given each month true mean values and variances for the most important parameters, corresponding to the multi-year period form which the DRY-months have been selected, or corresponding to meteorological normals. DRY's have been produced for Oslo, Bergen, Andoya, Stockholm, Copenhagen, and 22 sites in Switzerland. (AB) (14 refs.)

15311 (NEI-DK–1882) **Dannebrogsgade 18, Vesterbro - a project on urban renewal including passive and active solar heating. Results of measurements of conditions of energy and temperature carried out during a period of two years.** Clausen, I.L.; Oestergaard Jensen, S. Dansk Teknologisk Inst., Taastrup (Denmark). Proevestationen for Solenergi. Jan 1995. 100p. (In Danish). Contract ENS-51181-93.0009. Order Number DE95766511. Source: OSTI; NTIS.

The project on urban renewal in Vesterbro, Copenhagen (Denmark), which includes the use of active and passive solar heating, is described and the results of measurements taken of energy and temperature conditions are presented. Measurements are related to a retrofitted block of flats where the balconies have been covered with glass. Solar water heating was also innovated. (AB)

1410 Solar Collectors and Concentrators

15312 (DOE/CE/15601–T1) **Extra focal convective suppressing solar collector. Second quarterly technical progress report.** American Sun Co., Blue Hill, ME (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15601. Order Number DE95010170. Source: OSTI; NTIS; GPO Dep.

Second Quarter efforts have focused on completing Task 1 (refining and improving tracking electronics), and working on Tasks 2 and 3 (Optics and Absorber/Fluid System, respectively).

1430 Health and Safety

Refer also to citation(s) 15286

15 GEOTHERMAL ENERGY

15313 (DOE/EE–0043) **Geothermal progress monitor. Report No. 16.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Geothermal Div. Dec 1994. 85p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010519. Source: OSTI; NTIS; GPO Dep.

This issue, the 16th since 1980, illustrates the potential of the liquid-dominated geothermal resource. Achievement of this potential by publicly held companies, who are required to publish financial statements, has involved the use of high-quality resources and the best available technologies or, in some instances, their own innovative modifications of existing technologies as well as a high degree of technical and management expertise. This issue also documents some effects of the new climate of utility deregulation and competition among independent power producers on the geothermal industry. The continuing importance attached to geothermal heat pumps as a preferred space conditioning technology by a number of disparate interests is illustrated by a number of articles. Magma Power Co. reported record gains in both 1993 revenues and earnings over 1992; California Energy has acquired Magma, creating the largest geothermal energy producer in the world. Owing to stagnation in USA, it was decided to focus on international markets. After the introduction, the issue has sections on: Federal beat, industry scene, financing, technology development, direct use technology, state and local, international, technology transfer, and directory.

1501 Resources and Availability

15314 (LA–12903-PR) **Hot dry rock energy: Hot dry rock geothermal development program. Progress report. Fiscal year 1993.** Salazar, J.; Brown, M. (eds.). Los Alamos National Lab., NM (United States). Mar 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009525. Source: OSTI; NTIS; GPO Dep.

Extended flow testing at the Fenton Hill Hot Dry Rock (HDR) test facility concluded in Fiscal Year 1993 with the completion of Phase 2 of the long-term flow test (LTFT) program. As is reported in detail in this report, the second phase of the LTFT, although only 55 days in duration, confirmed in every way the encouraging test results of the 112-day Phase I LTFT carried out in Fiscal Year 1992. Interim flow testing was conducted early in FY 1993 during the period between the two LTFT segments. In addition, two brief tests involving operation of the reservoir on a cyclic schedule were run at the end of the Phase 2 LTFT. These interim and cyclic tests provided an opportunity to conduct evaluations and field demonstrations of several reservoir engineering concepts that can now be applied to significantly increase the productivity of HDR systems. The Fenton Hill HDR test facility was shut down and brought into standby status during the last part of FY 1993. Unfortunately, the world's largest, deepest, and most productive HDR reservoir has gone essentially unused since that time.

1502 Geology and Hydrology of Geothermal Systems

15315 (LA-UR–95-164) **Structural analysis of Precambrian rocks at the Hot Dry Rock Site at Fenton Hill, New Mexico.** Burns, K.L.; Potter, R.M. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950514–11: World geothermal congress: worldwide utilization of geothermal energy, Florence (Italy), 18-31 May 1995). Order Number DE95009436. Source: OSTI; NTIS; GPO Dep.

The subcrop of basement rock at Fenton HIll comprises Precambrian gneiss, schist, amphibolite, pegmatite, and granitoids with affinities in metamorphic and structural history to surface outcrops in the Tusas and Picuris Ranges. Televiewer measurements of structures were analyzed by taking advantage of the spatial continuity of foliations. Folds in the foliation are predominantly conical forms due to interference between structures formed in F2 and F3 tectonic events. Field observations of outcrops in the Picuris Range show that the fractures are predominantly an X-T network controlled by the lithological layering, and statistical evidence indicates that this layer-controlled network persists to depth at Fenton Hill.

1503 Geothermal Exploration and Exploration Technology

15316 (IAEA-TECDOC–788) **Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.** International Atomic Energy Agency, Vienna (Austria). Feb 1995. 268p. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

In the last ten years, geothermal energy has emerged as an alternative source of energy for electrical and non-electrical uses. In some of these countries geothermal energy contributed up to 40% of the national power requirement. In others, it is being widely used in agriculture, aquaculture, air conditioning, kiln and fruit drying, pulp and paper industry, greenhouses and food processing. The Co-ordinated Research Programme (CRP) on the Application of Isotope and Geochemical Techniques to Geothermal Exploration in the Middle East, Asia, the Pacific and Africa aimed at integrating isotope techniques with traditional geochemical and hydrological methods in understanding the characteristics of geothermal systems. It involved isotopic and chemical surveys of hot to cold springs, wells and rivers in exploration areas as well as in exploited reservoirs where problems such as return of injected wastewaters are experienced. This publication is a compilation of the scientific papers presented at the final Research Co-ordination Meeting, held in Dumaguete City, Philippines, from 12 to 15 October 1993. Refs, figs and tabs.

15317 (IAEA-TECDOC–788, pp. 9-20) **Application of isotope and geochemical techniques to geothermal exploration in Southeast China - A review.** Wang Jiyang (Academia Sinica, Beijing (China). Lab. for Geothermics); Pang Zhonghe. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Hot springs that are widely distributed in the SE coastal area of China and there have been a subject of dispute on their genesis and origin. Since mid 80's, with the support of the IAEA Research Contracts, isotope and geochemical techniques have been systematically applied to the geothermal systems in the region. The techniques have proven to be very useful and effective in geothermal exploration. ^{2}H and ^{18}O have been employed to study the origin and recharge of the systems, while ^{3}H and ^{14}C have been used to determine the age of the geothermal fluids. Fluid/mineral equilibrium modelling is also useful for the calibration and use of conventional chemical geothermometers and makes reservoir temperature prediction more reliable. Different geothermal systems from Fujian, Guangdong and Hainan Provinces were selected for the study. Results show that the geothermal systems in the study area all belong to the low-medium temperature geothermal systems of convective type, which essentially differs from high temperature geothermal systems with magmatic heat sources underneath. (author). 21 refs, 7 figs, 1 tab.

15318 (IAEA-TECDOC–788, pp. 45-61) **Processes influencing $\delta\ ^{2}H$, $\delta\ ^{18}O$, and Cl distribution in cold and thermal waters in the NW-Peninsula and in the Southern Lowlands, Iceland.** Arnorsson, S. (Iceland Univ., Reykjavik (Iceland). Science Inst.); Sveinbjoernsdottir, A.E.; Andresdottir, A. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Data on $\delta\ ^{2}H$ and $\delta\ ^{18}O$ in surface- and cold groundwaters in the NW-Peninsula and in the Southern Lowlands of Iceland plot close to a line with a somewhat shallower slope (6.44) than the meteoric line. The intercept with the $\delta\ ^{18}O$ axis is $\delta\ ^{2}H = -4.4$ per mille. This $\delta\ ^{2}H$ -$\delta\ ^{18}O$ relationship is considered to be representative for today's precipitation in Iceland. Geothermal waters with temperatures of less than about 50 deg. C show very limited, if significant, oxygen shift, whereas hotter waters do, the shift increasing with temperature of some one $\delta\ ^{18}O$ per mille unit for every 100 deg. C. In the NW-Peninsula the marine groundwater component can be accounted for by seawater infiltration into permeable fractures under present-day hydrological conditions. The Cl and B distribution relationships in the geothermal waters indicate that they represent local precipitation, as do the $\delta\ ^{2}H$ data for the NW-Peninsula. In the Southern Lowlands the $\delta\ ^{2}H$ of the geothermal waters is lower than that of local waters. This difference is not considered to reflect recharge areas to the geothermal systems on higher ground inland where today's precipitation is isotopically lighter than that in the Southern Lowlands. The cause is considered to be the presence of a component of "ice-age" water that was precipitated when the climate was significantly colder than today and, therefore, isotopically lighter. It appears that both aqueous B concentrations and the

amount of oxygen isotope shift in the geothermal waters can be used to estimate the amount of rock dissolved by unit mass of these waters. 21 refs, 8 figs, 1 tab.

15319 (IAEA-TECDOC–788, pp. 63-82) **Geochemical and isotope studies of the geothermal areas of central and Northern India.** Navada, S.V. (Bhabha Atomic Research Centre, Bombay (India). Isotope Div.); Nair, A.R.; Sharma, S.; Kulkarni, U.P. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Isotope and geochemical studies were carried out in Tattapani geothermal area in Central India. The thermal activity in the area is controlled by the ENE-WSW Tattapani fault and NE-SW cross faults. δD, $\delta^{18}O$ of hot springs and hot water well samples show enrichment compared to the cold springs. Some mixing of the shallow cold waters with the hot waters is possible in some hot springs. Tritium data show that the hot water have a residence time of over 30-40 years. Hot springs of Orissa and Bihar occur on an ENE-WSW lineament zone which is the extension of the zone where Tattapani geothermal area exist. The chemistry of hot spring samples of Bihar are similar to Tattapani geothermal waters. The hot springs of Orissa are high in sodium and chloride due to contribution from a marine source. The isotopic composition of a hot spring sample from Surajkund in Bihar is similar to thermal waters of Tattapani. The thermal water of Badrinath and Tapoban in northern India are situated at an elevation of 2000-3000 m above mean sea level in the Himalayan terrain. Thermal waters from Badrinath are of the NaCl type while those of Tapoban are of the $Ca(HCO_3)$ type. Thermal waters from Tapoban and Badrinath fall near the local meteoric line and show negligible oxygen shift from δD - altitude relationship the recharge area of Badrinath thermal waters is at 3200 m and those of Tapoban thermal waters at 2700 m. (author). 7 refs, 16 figs, 6 tabs.

15320 (IAEA-TECDOC–788, pp. 83-91) **Isotope study in geothermal fields in Java Island.** Wandowo, Z.A. (National Atomic Energy Agency, Jakarta (Indonesia). Center for Applications of Isotopes and Radiation). International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Study in two geothermal fields, Dieng and Kamojang, in Java island by utilizing isotope technique has been carried out. Isotopic data of wells, springs and other geothermal manifestations providing informations on the recharge area of precipitation contributed to geothermal resources, flow paths and origin of geothermal fluids. The data of oxygen shift has also provided information on the characteristic the fields. (author). 8 refs, 5 figs, 3 tabs.

15321 (IAEA-TECDOC–788, pp. 93-111) **The use of gas chemistry and isotope geothermometry to study the effects of exploitation and reinjection on the fluids at Larderello, Italy.** Panichi, C. (CNR - International Inst. for Geothermal Researches, Pisa (Italy)); Noto, P.; Bellucci, L.; Scandiffio, G.; Baccarin, F.; Valenti, M. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Isotopic and chemical analyses of the steam and gas from producing wells since exploration until 1992, were used to define the effects of the exploitation and reinjection of waste fluids. Maps showing zonations of the isotopic composition of the steam and chemical concentrations of the gas mixtures in the Larderello geothermal system are derived independently. Inspection of the maps obtained before and after reinjection reveals good discrimination between the natural inflow of meteroic water subsequent to exploitation and of man-made recharge using waste fluids. Chemical variations of Ar appear to be a valuable tool for evaluating a recovery factor of reinjected water. Isotopic variations in H_2, CH_4 and CO_2 are used to describe disequilibrium conditions between gas components induced by the establishment of a liquid plume at the production zone of the reservoir. (author). 12 refs, 14 figs, 1 tab.

15322 (IAEA-TECDOC–788, pp. 127-147) **Isotopic and chemical studies of geothermal waters of Northern Areas in Pakistan.** Dildar Hussain, S. (Pakistan Inst. of Nuclear Science and Technology, Islamabad (Pakistan)); Ahmad, M.; Akram, W.; Sajjad, M.I.; Gonfiantini, R.; Tasneem, M.A. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Northern Areas is one of the major thermal fields of Pakistan with more than two dozen known hot springs having discharge temperature ranging from 35 deg. C to 94 deg. C. Isotopic and chemical techniques applied to study the geothermal fields show that thermal waters are of meteoric origin and can be classified as $Na\text{-}HCO_3$, $Na\text{-}SO_4$ and mixed type on the basis of their chemical contents. At some places cooling of thermal waters seems to be due to steam separation whereas mixing with fresh cold water is prominent at the remaining sites. The temperatures estimated by isotopic and chemical geothermometers for the two major fields i.e. Tatta Pani and Murtazabad are 83-257 deg. C and 65-296 deg. C respectively. (author). 24 refs, 11 figs, 3 tabs.

15323 (IAEA-TECDOC–788, pp. 149-168) **Applications of stable isotopes in geothermal exploration in the Philippines - A review.** Gerardo, J.Y. (Philipinne National Oil Company, Energy Development Corp., Makati, Metro Manila (Philippines). Geothermal Div.); Alvis Isidro, R.R.; Sanchez, D.R.; Clemente, V.C.; Gonfiantini, R. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

A review of the isotopic data from geothermal exploration areas in the Philippines indicates that the surface thermal waters and well discharges are enriched in heavier isotopes and deviate from the local meteoric water line defined by $\delta^2H = 8\delta^{18}O + (14 \pm 2)$. This enrichment is commonly due to: 1) near surface evaporation; and 2) mixing between meteoric waters and isotopically enriched deep magmatic waters, a phenomenon confirmed by deep well fluids in developed Philippine geothermal systems, such as Tongonan, Palinpinon and Alto Peak. Waters that are isotopically enriched due to the latter are found to be more significant to exploration because in most cases, these are representative of fluids from hotter sources. The dominant process forming these waters can be distinguished by the relationship between stable isotopes and Cl compositions. (author). 27 refs, 12 figs, 3 tabs.

15324 (IAEA-TECDOC–788, pp. 169-184) **Geochemical and isotopic investigation of Biliran geothermal discharges, Philippines.** Ramos Candelaria, M.N. (PNOC-Energy Development Corp., Makati, Metro Manila (Philippines)); Ruaya, J.R.; Baltasar,

A.S.J. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

The most impressive thermal feature on Biliran island is the Vulcan-Libtong thermal area which hosts a volcano-andesitic hydrothermal system. The chemical signatures of the original andesitic vapors are largely retained in the fluid discharge chemistry and isotope composition. The Vulcan Fault is believed to be the main conduit for the passage of acid andesitic gases from a cooling magma beneath Vulcan to the surface. Away from the Vulcan area, a neutral Cl brine has already evolved by progressive neutralization of a previously acid fluid by intensive water-rock interaction. This neutral water was encountered at depth by wells BN1 and BN2. BN3 drilled close to the Vulcan Fault discharged highly acidic fluids. The main constraint towards the development of the resource is the presence of acid andesitic volatiles at the central portion and the limited area available for exploitation by conventional techniques. (author). 14 refs, 7 figs, 5 tabs.

15325 (IAEA-TECDOC–788, pp. 185-208) **Chemical and isotopic studies of fluids in the Bacon-Manito geothermal field, Philippines.** Ruaya, J.R. (Philippine National Oil Company, Energy Development Corp., Quezon City (Philippines). Energy Research and Development Div.); Buenviaje, M.M.; Solis, R.P.; Gonfiantini, R. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Chemical and isotopic data from springs rainfall and wells have been used to characterize the fluids and to identify the major reservoir processes at Bacon-Manito geothermal field, Philippines. The deep reservoir fluid is postulated to be heated to about 325 deg. C and have 7500-8500 mg/kg chloride. Its chemical and isotopic composition is best characterized by wells OP-3D and OP-4D. Spring isotopic data show that their discharges are predominantly meteoric in origin, with a few following a simple evaporation trend. Chloride-enthalpy and chlorid-$\delta^{18}O$ relations reveal that the upflowing geothermal reservoir fluid undergoes: (1) dilution with meteroic water, (2) conductive cooling as these move away, (3) mixing with steam condensate, and (4) vapor gain. Well gas chemistry points to the absence of direct magmatic contributions while it is shown that the equilibrium reaction $CH_4 + 2H_2O = CO_2 + 4H_2$ is likely to be established. The observed positive ^{18}O shifts of well waters relative to the local water meteoric line were considered to be due primarily to mixing of deeply-seated "andesitic" and meteoric waters while water-rock interaction could not be ruled out. Finally, a conceptual geochemical model of the geothermal system is proposed. (author). 21 refs, 12 figs, 5 tabs.

15326 (IAEA-TECDOC–788, pp. 209-231) **Isotopic and chemical composition of waters and gases from the east coast accretionary prism, New Zealand.** Giggenbach, W.F. (Institute of Geological and Nuclear Science, Lower Hutt (New Zealand)); Stewart, M.K.; Lyon, G.L.; Sano, Y.; Goguel, R.L. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Gases and saline waters discharges from springs and mud volcanoes along the east coast of the North Island of New Zealand provide a unique opportunity to study the evolution of fluids within an active accretionary prism. The waters show intermediate (5000 mg Cl/kg) to high (26,000 mg Cl/kg) salinities and are enriched in both deuterium ($\delta\ ^2H$ from -20 to -2 per mille) and oxygen-18 ($\delta^{18}O$ from +3 to 7 per mille) with respect to local groundwater. Cl/Br ratios are with 250±50 close to those of seawater (285), B/Cl ratios are higher than those of seawater (0.0003) and range from 0.003 to 0.03 at comparatively uniform Li/B ratios of 0.05 ± 0.03. Relative Na, K and Mg contents suggest close attainment of water-rock equilibrium at temperatures of 85 ± 25 deg. C. Gas geothermometers (CO_2, CH_4, Ar) indicate equilibration in the liquid phase at somewhat higher temperatures of 100 ± 20 deg. C. Ratios of $^3He/^4He$ in gases from the central sector reach values of 3.35 R_A indicating the presence of about 40% of mantle He. Significant amounts of N_2 appear to be added from other than atmospheric sources. Formation of the highest Cl water (26,000 mg Cl/kg) is explained in terms of the hydration of basalt of a subducted seamount to form chlorite or serpentine. The isotopic and chemical compositions of the waters in the subducting sediments are compatible with the assumption that they form the main source for the magmatic components of waters discharged from andesitic volcanoes and associated geothermal systems. (author). 37 refs, 9 figs, 3 tabs.

15327 (IAEA-TECDOC–788, pp. 232-248) **Isotope and geochemical survey of geothermal systems of Yozgat province in Central Anatolia, Turkey.** Simsek, S. (Hacettepe Univ., Ankara (Turkey). International Research and Application Center for Karst Water Resources (UKAM)). International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

In Central Anatolia, which is subject to this project area, there are many geothermal fields. Turkish State Planning Organization (DPT) gives priority and encouragement to the investments of tourism and energy production. Our studies, in Central Anatolia are planned to focus on mainly Yozgat- Nevsehir region. But only Yozgat province results will be given in this paper. Detailed hydrogeological and hydrogeochemical studies have been carried out and periodic hydrogeochemical analyses made in Hacettep University International Research and Application Center for Karst Water Resources (UKAM) Laboratories. Analyses of samples (^2H, ^{18}O, ^3H) which were periodically collected from thermal and cold water spots in the project area have been made in IAEA. Hydrogeologic models for important geothermal fields in Yozgat region have been realized as a result of this study. Following are the results obtained from the isotopic evaluations of the geothermal fields: According to the $\delta^{18}O$ vs. δ^2H relation of rain and snow water samples, the project area represents a climatic transition zone between the East Mediterranean and Central Anatolia Climatic · Geographic Regions by the local meteoric line equation of $\delta^2H=8*\delta^{18}O+14$; according to the tritium analyses, thermal waters have deep and long groundwater flow paths and these waters are generally older than 50 years; according to the $\delta^{18}O$ vs. δ^2H relation, there are ^{18}O shift in Yozgat-Saraykent, Bogazliyan and Sorgun; Yozgat-Saraykent, Sorgun and Bogazliyan geothermal fields are important for geothermal applications as mainly central heating and balneological utilization possibilities. (author). 21 refs, 12 figs, 4 tabs.

15328 (IAEA-TECDOC–788, pp. 249-267) **Preliminary geochemical and isotopic study of the South Trungbo geothermal area in Central Viet Nam.** Nguyen Tract Viet (Centre for Nuclear Technique Application, Ho Chi Minh City (Viet Nam)); Nguyen Kein Chinh; Huynh Long; Nguyen Dieu Minh; Phan Thanh Tong. International Atomic Energy Agency, Vienna (Austria). Feb 1995. Contract IAEA-R-5840/RB. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and

Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

Stable isotopes (deuterium and oxygen-18) as well as geochemical data from South Trungbo geothermal area have been studied in order to deal with the chemistry classification, recharge area of hot waters and reservoir temperature. From geological and geomorphological point of view, hot waters are divided into two groups, corresponding to two zones: Coastal Strip and Northern Highland. According to stable isotopes, the recharge area of hot waters occur at about 500-600m a.s.l and 700-900m a.s.l for two above zone respectively. Moreover, there is no evidence for isotopic exchange between hot waters and host rock. Several classical geothermometers such as chalcedony, quartz, Na-K, Na-K-Ca as well as the mixing model given by Fournier and Truesdell have been applied to estimate the reservoir temperature. The results obtained are less than 150-180 deg. C. Both geochemical and isotopic data indicate that the South Trungbo is a low-enthalpy geothermal system. (author). 7 refs, 7 figs, 6 tabs.

1505 Economic, Industrial, and Business Aspects

Refer also to citation(s) 15314

15329 (INIS-mf–14509) **Geothermal energy in Jordan.** Al-Dabbas, Moh'd A. F. Ministry of Energy and Mineral Resources, Amman (Jordan). Nov 1993. 15p. Order Number DE95628112. Source: OSTI; NTIS (US Sales Only); INIS.

The potential of geothermal energy utilization in Jordan was discussed. The report gave a summary of the location of geothermal anomalies in Jordan, and of ongoing projects that utilize geothermal energy for greenhouse heating, fish farming, refrigeration by absorption, and water desalination of deep aquifers. The problems facing the utilization of geothermal energy in Jordan were identified to be financial (i.e. insufficient allocation of local funding, and difficulty in getting foreign financing), and inadequate expertise in the field of geothermal energy applications. The report gave a historical account of geothermal energy utilization activities in Jordan, including cooperation activities with international organizations and foreign countries. A total of 19 reports already prepared in the areas of geochemical and hydrological studies were identified. The report concluded that the utilization of geothermal energy offers some interesting economic possibilities. (A.M.H.). 4 refs. 1 map.

15330 (INIS-mf–14510) **Uses of geothermal energy in Jordan for heating greenhouses; project proposal.** Al-Dabbas, Moh'd A. F. (Ministry of Energy and Mineral Resources, Amman (Jordan)); Masarwah, Rober; Elkarmi, Fawwaz. Ministry of Energy and Mineral Resources, Amman (Jordan). Aug 1993. 11p. Order Number DE95628113. Source: OSTI; NTIS (US Sales Only); INIS.

A proposal for the exploration of geothermal energy in Jordan for heating greenhouses. The report gives some background information on geothermal anomalies in Jordan, and outlines some on-going uses of geothermal energy in various parts of Jordan. The proposal is modelled on the 2664 square meter Filclair Super 9 Multispan greenhouse from France. The overall cost of the project involves three variables, the cost of the borehole, the cost of the greenhouse, and the cost of engineering services. The total cost ranges between three to four million dollars depending on the quantity and quality of information to be collected from the borehole. The advantages of geothermal heating compared with oil heating are emphasized. The project will enable geothermal heating and horticultural production to be monitored throughout the year, will produce data enabling rational and reliable water resources management, and will produce environmentally clean and efficient energy. (A.M.H.). 1 tab. 1 map.

1508 Geothermal Power Plants

Refer also to citation(s) 15313

1509 Geothermal Engineering

Refer also to citation(s) 15314

1510 Direct Energy Utilization

Refer also to citation(s) 15313

1520 Geothermal Data and Theory

15331 (DOE/ER/14115–T1) **Electrochemical determination of the Gibbs free energies of rock-forming minerals. Final report.** Anovitz, L.M. Arizona Univ., Tucson, AZ (United States). Dept. of Geosciences. [1994]. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14115. Order Number DE95009682. Source: OSTI; NTIS; GPO Dep.

This grant provided support for a series of measurements of thermodynamic data for rock-forming minerals using an electrochemical approach. The relative accuracy of electrochemical measurements and the fact that this technique is the only one that directly measures the Gibbs energy of a phase as a function of temperature makes data obtained in this manner ideal for many types of geochemical calculations. A laboratory for these measurements was completed, and data were acquired on a series of metal-oxide buffers. Data were obtained with precisions of approximately ±20 J/mole O_2 at a single temperature, and fitted precisions of ±50 J/mole O_2. Tests of the accuracy of these data were completed by running relative to air, to air through an intermediate gas stage, and relative to a solid buffer, and temperatures were calibrated relative to a primary standard obtained from NIST. These tests suggested that precision of currently available electrochemical studies may not reflect the accuracy of these measurements. The chemical potential of oxygen measured at any given temperature for all solid buffers tested appears to be a direct function of the voltage across the electrolyte containing the solid sample. Further tests of this effect, and recalibration of most or all of these reactions are needed if truly accurate data for these basic reactions are to be available. Preliminary to a planned electrochemical measurements on pyroxenes, a thermodynamic model of the system diopside-enstatite was derived. These results suggest that the activity/composition relations derived from solvus data are strongly dependent on the thermodynamic formulation chosen. This appears to be especially true for ordered intermediate compositions like diopside.

1540 Waste Management

15332 (BNL–61531) **Biochemical processing of geothermal brines and sludges.** Premuzic, E.T.; Lin, M.S.; Lian, H. Brookhaven National Lab., Upton, NY (United States). Mar 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950388–1: 13. geothermal program review, San Francisco, CA (United States), 13-16 Mar 1995). Order Number DE95009652. Source: OSTI; NTIS; GPO Dep.

Development of cost-efficient biochemical processes for the treatment of geothermal brines and sludges has led to the identification of several options which allow one to convert geothermal wastes into useful products. A laboratory scale pilot plant operating in a batch mode has been constructed and used to extract and recover toxic and valuable metals and metal salts from geothermal residues. Metal extraction and recovery efficiencies of better than 80% per five to twenty-five hour treatment cycles have been achieved. The new technology is versatile and can be applied to brines and sludges derived from hypersaline as well as low salinity resources. The biochemical processes can be integrated with existing facilities, allow recycling options, and yield revenue generating feedstocks and waste volume reduction. Selected versions of this technology are now being readied for field trials. Recent advances and the current status of the emerging technology will be discussed in this paper.

17 WIND ENERGY

1701 Resources and Availability (Climatology)

Refer also to citation(s) 15350

15333 (RISO-R–797(EN), pp. 5-11) **The new Irish Wind Resource Atlas.** Landberg, L. (Risoe National Lab., Meteorology and Wind Energy Department, Roskilde (Denmark)); Watson, R. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. Contract JOUR-0067. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

This paper will describe the state of the development of the new Irish Wind Atlas. The new atlas is made up of three parts: Observations from 14 Irish Meteorological Service stations, measurements from a CEC-funded measuring campaign from 12 stations and finally output from the KAMM meso-scale model. (au)

15334 (RISO-R–797(EN), pp. 12-16) **Wind and turbulence in the near-coastal offshore environment.** Hoejstrup, J. (Risoe National Lab., Department of Meteorology and Wind Energy, Roskilde (Denmark)); Barthelmie, R.J.; Courtney, M.S.; Sanderhoff, P. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The general characteristics of the offshore wind climate is somewhat different from the onshore situation. The rather small values for surface roughness encountered at sea are responsible for higher wind speeds and reduced turbulence intensities. There are a number of interesting problems associated with this environment: The surface roughness of the sea is quite well known for open ocean conditions, but in the near-shore situation we would expect somewhat different (higher) values because of changed wave structure with breaking and refracting waves near the coast. The lower turbulence levels should consume less of the fatigue life of the turbines, but the wakes from upstream turbines will disperse more slowly and maintain larger velocity gradients than for the corresponding situation in a conventional wind farm. Are these effects significant? How far away from the coast should the wind farm be placed such that wind from land has accelerated to a value sufficiently close to its equilibrium open sea value. In the following we will concentrate on the first two problems, surface roughness and turbulence, and touch briefly on third problem. (EG)

15335 (RISO-R–797(EN), pp. 17-24) **Experimental study of flow modification in a coastal mediterranean area, application of a mesoscale model.** Sempreviva, A.M. (Instituto di Fisica dell'Atmosfera, C.N.R., Rome (Italy)); Lavagnini, A.; Melas, D.; Quesada, V. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

In this paper we have considered data series of wind and temperature from five stations located at the west coast of Sardinia. We have estimated stability conditions frequency and wind distributions and found that sites located within an area of few kilometres of radius can have different characteristics. Furthermore we have noticed that on the contrary of north European regions, in such atypical Mediterranean area horizontal variation of temperature can be very strong and become the most important parameter to explain the mentioned differences. We have focused on one of the areas and applied the EEC model WAsP to simulate the wind distributions within it. The model does not give reliable results. From the experimental results, we guess that this is mainly due to the two constraints on which WAsP is based namely same surface geostrophic climatology and same stability within the considered region of application. Starting from this argument we could try to identify areas that can fulfill WAsP conditions and apply the model within the area. This could be achieved by using prognostic mesoscale models and good surface and upper-air databases. (au) (12 refs.)

15336 (RISO-R–797(EN), pp. 29-33) **Fly-wheel calibration of cup-anemometers.** Fabian, O. (Risoe National Laboratory (Denmark)). Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

Within the business of wind turbine energy the accurate measurement of wind speed is an important but difficult exercise. To estimate the energy with sufficient confidence anemometers used to measure the wind speed must usually be calibrated in a wind tunnel, where the anemometer signal can be related to the wind speed via a pitot-static tube (and other instruments). Furthermore, the accuracy must be maintained through periodic calibration since most anemometers are subjected to wear and tear, which may change the properties. In the present method the anemometers are tested purely mechanical rather than using the wind tunnel. Only a sample of 2-3 anemometers shall be calibrated in the wind tunnel. Then the measured calibration characteristic can be generalized with sufficient accuracy by subjecting all anemometers to appropriate quality assurance (QA). All anemometers must be checked periodically, whereas the wind tunnel calibration of the test sample need only be carried out once. The QA-system under development at The Test Station for Wind turbines at Risoe National Laboratory is base on measuring the mechanical friction and inspecting the anemometer cups by means, which can be established in any workshop. (EG)

15337 (RISO-R–797(EN), pp. 34-35) **The variability of the European wind resource.** Landberg, L. (Risoe National Laboratory (Denmark)). Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

Short communication EUROPE/wind; RESOURCE ASSESSMENT; SITE CHARACTERIZATION; EUROPE; WIND; METEOROLOGY; DATA COMPILATION; SEASONAL VARIATIONS

1704 Economic, Industrial, and Business Aspects

15338 (NEI-DK–633(rev.)) **Wind power in the 90's. Pure energy.** Foreningen af Danske Vindmoellefabrikanter, Herning (Denmark). May 1994. 18p. Contract ENS-UVE-90.0040. Order Number DE95772360. Source: OSTI; NTIS; INIS.

The status, historical background and future prospects of wind energy in Denmark are described. Furthermore, the certification system of wind turbines, the electric supply system, wind farms, economy, practical experience, environmental impacts and exports are dealt with. A list of useful addresses within the Danish wind industry is included. (CLS)

15339 (NEI-DK–1881) **European wind turbine catalogue.** Energy Centre Denmark, Copenhagen (Denmark). 1994. 63p. Order Number DE95766443. Source: OSTI; NTIS; INIS.

The THERMIE European Community programme is designed to promote the greater use of European technology and this catalogue contributes to the fulfillment of this aim by dissemination of information on 50 wind turbines from 30 manufacturers. These turbines are produced in Europe and are commercially available. The manufacturers presented produce and sell grid-connected turbines which have been officially approved in countries where this approval is acquired, however some of the wind turbines included in the catalogue have not been regarded as fully commercially available at the time of going to print. The entries, which are illustrated by colour photographs, give company profiles, concept descriptions, measured power curves, prices, and information on design and dimension, safety systems, stage of development, special characteristics, annual energy production, and noise pollution. Lists are given of wind turbine manufacturers and agents and of consultants and developers in the wind energy sector. Exchange rates used in the conversion of the prices of wind turbines are also given. Information can be found on the OPET network (organizations recognised by the European Commission as an Organization for the Promotion of Energy Technologies (OPET)). An article describes the development of the wind power industry during the last 10-15 years and another article on certification aims to give an overview of the most well-known and acknowledged type approvals currently issued in Europe. (AB)

15340 (NEI-DK–1881, pp. 7-10) **Certification and type approval of wind turbines.** Friis Pedersen, T. (Risoe National Lab., The Test Station for Wind Turbines, Roskilde (Denmark)). Energy Centre Denmark, Copenhagen (Denmark). 1994. In *European wind turbine catalogue.* 63p. Order Number DE95766443. Source: OSTI; NTIS.

Information is given on the certification and type approval of wind turbines in Europe and on the following certification bodies: CIWI-Holland (Arnhem), Det Norske Veritas (Copenhagen Denmark), The Test Station at Risoe National Laboratory (Roskilde, Denmark), and Germanischer Lloyd (Hamburg, Germany). (AB)

15341 (RISO-R–797(EN), pp. 131-134) **Replacement of older wind turbines - perspectives and measures in Denmark.** Andersen, P.D. (Risoe National Lab., Dept. of Meteorology and Wind Energy (Denmark)); Lemming, J. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

A replacement program has been initiated in Denmark. The aims and spin-offs of this program are: removal of old and small wind turbines scattered sited in the open land, mitigation of neighbor complains, mitigation of the small but increasing public disapproval of wind turbines, an enlarged total MW-potential, a stimulation of the wind turbine market, and an economical relieve of pioneer wind turbine owners. The replacement program is based on subsidies to owners who are replacing their old or misplaced turbines. Five month into the program 16 turbines have been replaced, and 3.5 MW of wind power capacity has been added. (au)

1705 Environmental Aspects

Refer also to citation(s) 15344

15342 (NEI-DK–1955) **Vibration and noise analysis of gearbox for NTK 500/37 wind turbine.** Crone, A. Oedegaard og Danneskiold-Samsoee ApS, Copenhagen (Denmark). Mar 1995. 20p. Contract ENS-1364/91-0010. Order Number DE95772375. Source: OSTI; NTIS; INIS.

EFP-91.

The overall aim was to to develop methods for the description of the structure-borne noise-source strength of wind turbine gearboxes. A gearbox manufactured by Jahnel-Kestermann for a 500 kW "Nordtank" wind turbine was examined. Intensive vibration tests of the gearbox were carried out at the test bed at the manufacturer's factory and nose emission from the wind turbine was measured when the gearbox had been remounted. The main results of the study are presented. Vibration measurements made on the gearbox for NTK 500/37 showed an average velocity level at the tooth mesh frequency of the output gear stage of L_v = 105 dB / 1 nm/s on the input bearing housing in load conditions corresponding to a wind speed of 8 m/s, 10 m above ground. Evaluation of the influence of load on the gearbox vibration showed a minimum velocity level at a torque corresponding to a wind speed of 6 - 7 m/s, 10 m above ground (160 kW). This is evaluated as ideal. Velocity levels at the harmonics of the tooth mesh frequencies may change by more than 10 dB in a speed range close to the operational speed. Changes are due to natural vibration modes in the gearbox structure. After remounting of the gearbox, noise measurements showed a noise emission level of $L_{WA,ref}$ = 99 dB /1 pW. Tonal components were identified in the noise spectrum at frequencies corresponding to the 1st and 3rd harmonics of the tooth mesh frequency of the output gear stage (approx. 604 Hz, and 1808 Hz). Noise transmission of structure born noise from the gearbox to the exterior of the wind turbine was evaluated as average. (AB)

1706 Wind Energy Engineering

Refer also to citation(s) 15338, 15342, 15613

15343 (AUC-IBT-R–9347) **Fatigue tests on laminated wooden beams. Partial report 17. Materials testing of series L, M and N.** Pilegaard Hansen, L.; Rathkjen, A. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Dec 1993. 40p. (In Danish). Contract TR-88.1040; Contract ENS-51171-92.0004. Order Number DE95772418. Source: OSTI; NTIS.

The report gives the detailed results of tests of parts of laminated wooden beams under tensile and pressure tests, carried out after the whole beams had been subjected to fatigue tests. (AB)

15344 (NEI-DK–1424-Rev.) **Vibration analysis of 1 MW gearbox for the Avedoere wind turbine. Test bed measurements.** Crone, A. Oedegaard og Danneskiold-Samsoee ApS, Copenhagen (Denmark). Mar 1995. 38p. Contract ENS-1364/90-0002; Contract ENS-1364/91-0010. Order Number DE95766471. Source: OSTI; NTIS; INIS.

EFP-90; EFP-91.

The investigations had several purposes: Firstly, to determine and evaluate the structure-borne noise source strength of the gearbox, which is relevant for the final gear noise emission from the wind turbine. Secondly, to select the potentially least noisy gear set out of two, which have been made for the output gear stage. And Thirdly, to obtain the natural vibration modes of the gearbox structure, in order to determine if the structure-borne noise, transmitted to the wind turbine structure, will be amplified due to resonance conditions. Additional vibration tests were carried out. Among these, trials of 'in situ' measurement of the Transmission Error of the output gear stage, and measurements of the torsional vibrations of the input and output shaft. The test of the two output gear sets (from Flender AG and ELKRAFT A.m.b.A.) had the aim to determine the least noisy one of two different tooth profiles. Both gear sets were intended for the Avedoere Wind Turbine when it, in its first period of operation, is going to operate as a stall regulated turbine. After the first mesurements and the exchange of the Flender-designed gear set with the ELKRAFT-designed gear set, troubles with the backmost bearing of the intermediate shaft arose. The evaluation of the structure-borne noise source strength (expressed as the vibration velocity level), has in general been made at load conditions which correspond to the conditions in the wind turibne at a wind speed of 8 m/s, 10 m above terrain (v_{10}). This condition, is the one normally used when the noise emission from wind turbines is evaluated. At the comparison of the two gear sets against each other, the influence of the torque load on the source strength has also been considered. This comparison may indicate the load at which the profile correction is most effective, and may determine the noise potential of the gearbox at wind speeds lower than 8 m/s, which could also be of interest. (CLS)

15345 (NEI-DK–1877) **Improvements on the power characteristics of the small scale wind turbine FC-4000 wind motor.**

Schmidt, D. Nordvestjysk Folkecenter for Vedvarende Energi, Hurup (Denmark). Oct 1994. 43p. Contract ENS-UVE-90.0047. Order Number DE95766509. Source: OSTI; NTIS.

The following report is an extract from the German report 'Verbesserung der Leistungscharakteristik der Kleinwindkraftanlage FC - 4000 Wind Motor', written after work in the Folkecenter for Renewable Energy /Denmark from April 11 to October 1 1994. If there is some special interest in the FC - 4000 in general, the reports about the FC -4000 mentioned in reference of this report are recommended. The FC - 4000 Wind Motor belongs to the series of small scale wind turbines, developed by the Folkecenter for Renewable Energy for Application under different climatic conditions, like the extremely high wind regimes in the Arctic, the low wind regimes in the Tropics and the medium wind regimes like in Denmark. The FC - 4000 Wind Motor is a 1.5 kW wind turbine, designed for low wind regimes. It has a wide range of applications such as grinding, water pumping, cooling or battery charging. (EG) (22 refs.)

15346 (NEI-DK–1943) **Grid-connection of wind turbines and wind farms.** Koelbaek Jensen, K. Danske Elvaerkers Forenings Udredningsafdeling (DEFU), Lyngby (Denmark). Jun 1993. 15p. Order Number DE95766548. Source: OSTI; NTIS.

Power generation by wind turbines is controlled by several parameters. Changes in the stationary voltage levels, voltage fluctuations, inrush currents, voltage regulation in HV/MV substations, reactive power compensation and short circuits are all essential for efficient grid connection of wind turbine arrays. (EG)

15347 (NEI-DK–1971) **Aerodynamics of wind turbines.** Maribo Pedersen, B. (ed., Technical University of Denmark. Dept. of Fluid Mechanics, Lyngby (Denmark)). Danmarks Tekniske Univ., Lyngby (Denmark). Afd. for Fluid Mekanik. 1994. 359p. Contract ENS-1364/93-0001. (CONF-9411219–: 8. Symposium on aerodynamics of wind turbines, Lyngby (Denmark), 21-22 Nov 1994). Order Number DE95772389. Source: OSTI; NTIS.

EFP-93; JOULE-2.

Twenty three papers presented by participants at the 8th symposium on Aerodynamics of Wind Turbines held in Lyngby (Denmark) on November 21-22 1994 under the implementing agreement for cooperation in the research and development of wind turbine systems Annex XI (International Energy Agency. IEA Joint Action). (AB)

15348 (NREL/TP–441-7805) **Wind turbine trailing edge aerodynamic brakes.** Migliore, P.G. (National Renewable Energy Lab., Golden, CO (United States)); Miller, L.S.; Quandt, G.A. National Renewable Energy Lab., Golden, CO (United States). Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-950309–2: 25. annual conference and exhibition on wind power, Washington, DC (United States), 26-30 Mar 1995). Order Number DE95004061. Source: OSTI; NTIS; GPO Dep.

Five trailing-edge devices were investigated to determine their potential as wind-turbine aerodynamic brakes, and for power modulation and load alleviation. Several promising configurations were identified. A new device, called the spoiler-flap, appears to be the best alternative. It is a simple device that is effective at all angles of attack. It is not structurally intrusive, and it has the potential for small actuating loads. It is shown that simultaneous achievement of a low lift/drag ratio and high drag is the determinant of device effectiveness, and that these attributes must persist up to an angle of attack of 45°. It is also argued that aerodynamic brakes must be designed for a wind speed of at least 45 m/s (100 mph).

15349 (RISO-R–670(EN)) **Dynamic stall measurements on a 19 m diameter HAWT.** Aagaard Madsen, H.; Schmidt Paulsen, U. Risoe National Lab., Roskilde (Denmark). Test Station for Wind Turbines. Feb 1995. 33p. Contract ENS-1364/92-0001; Contract ENS-1364/91-0001; Contract E Order Number DE95766519. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

EFP-92; EFP-91; EFP-90.

The main objective of the present project has been to provide detailed experimental results on dynamic stall and stall hysteresis on a stall regulated wind turbine. Such data are of big importance for the development and validation of engineering stall hysteresis models. The experimental set-up which is implemented on a 19 m diameter stall regulated rotor with a rated power of 100 kW has been developed in a previous project. The main features are a system for measuring the aerodynamic forces on three blade segments of the blade and a five hole pitot tube mounted on the rotating blade for measuring the angle of attack and the relative inflow velocity vector. Measurements have been performed in yawed conditions as well as during normal operation. For operation in yaw regular stall hysteresis loops have been measured with characteristics corresponding quite well to the elements in the Beddoes stall delay model. In normal operation the loops are much more irregular. In order to estimate the importance or stall hysteresis in this situation, the variance of a simulated aerodynamic load based on the measured quasi steady C_N vs. α curve was compared with the variance of the actual measured aerodynamic force. The variance of the measured force turned out to be about 30 % higher than the force derived on quasi steady aerodynamics. Finally, flow visualization with tufts has been carried out and correlated with inflow measurements. In this way, the position of the separation line as function of measured angle of attack has been found. (au) (1 tab., 32 ills., 8 refs.)

15350 (RISO-R–797(EN)) **Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.** Larsen, G.C. (ed.). Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. 136p. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The 5'th European Wind Energy Association Conference and Exhibition - EWEC'94 - was held in Thessaloniki, Greece during the period 10-14 October 1994. 461 delegates, mainly from Europe but also from other parts of the world, attended the conference. The conference contributions included 235 oral presentations and 143 posters. The Department of Meteorology and Wind Energy contributed with 18 oral presentations and 3 poster with members of the department as authors or co-authors. The present report contains the full set of these papers, covering a wide spectrum of subjects including wind resources, reliability and load assessment, grid connection, wind-diesel systems, and marked aspects. (au) (36 tabs., 163 ills., 150 refs.)

15351 (RISO-R–797(EN), pp. 25-28) **Implementing wind forecasting at a utility.** Landberg, L. (Risoe National Laboratory, Roskilde (Denmark)). Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

This paper will describe a project that has as its main task to implement prediction of the power produced by wind farms in the daily planning at a utility. The predictions are generated from forecasts from HIRLAM (High Resolution Limited Area Model) of the Danish Meteorological Institute. these predictions are then made valid at individual sites (wind farms) by applying a matrix generate by the submodels of WA^{s}P (Wind Atlas Application and Analysis Program). In the project 17 wind farms have been selected for study. The farms are located on Zealand (13) and Bornholm (4) islands and all belong to the Danish utility ELKRAFT/Sjaellandske Kraftvaerker. (au)

15352 (RISO-R–797(EN), pp. 36-41) **The IEC safety code for wind turbines.** Christensen, C.J. (Risoe National Laboratory, Dept. of Meteorology and Wind Energy, The Test Station for Wind Turbines, Roskilde (Denmark)); Hjuler Jensen, P. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p.

Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The IEA Draft International standard - DRAFT IEC 1400-1: Wind Turbine Generator Systems, Part 1: Safety Requirements is described. A short discussion of the limited experiences so far obtained is given. Finally the future activity of the IEC/TC88 is described. (au)

15353 (RISO-R–797(EN), pp. 42-46) **Experimental determination of structural properties by non-destructive methods.** Larsen, G.C (Risoe National lab., Department of Meteorology and Wind Energy, Roskilde (Denmark)); Kretz, A. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

Three types of non-destructive tests have been exploited to determine mass distribution, stiffness distribution, and mode shapes of a wind turbine glade in order to improve the test procedures in the Danish certification system. While the blade is mounted in a rigid test stand for the standard strength and fatigue test, the test programme is easily extended to include an investigation of the above structrual properties. The mass distribution is determined based on the difference in strain gauge signals due to a 180 degrees rotation of the tip, and the mode shapes are determined from registrations of blade accelerations originating from a sinusoidal excitation of the blade, fine tuned to the relevant natural frequency. The method is redundant, and an easy test of the overall accuracy is performed by comparing the ratio between the generalized mass and the generalized stiffness to the square of the relevant natural frequency. (au)

15354 (RISO-R–797(EN), pp. 47-58) **Navier-stokes solver for rotating wing.** Hansen, M.O.L. (Technical University of Denmark, Department of Fluid Mechanids (Denmark)); Michelsen, J.A.; Soerensen, N.N. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

A 3-D/2-D Navier-Stokes solver for incompressible, steady viscous flow is described. The ability of this code to compute aerodynamic flows for wind turbine applications is first tested on an airfoil and a non-rotating wing. Finally, the centrifugal and Coriolis forces are included and a computation of a complete rotating blade is done, showing spanwise flow in the separated region on the suction side radially towards the tip. (au)

15355 (RISO-R–797(EN), pp. 59-65) **Dynamic stall and 3D effects.** Bjoerck, A. (FFA, The Aeronautical Research Institute of Sweden (Sweden)); Thor, S.E.; Fiddes, S.P.; Brand, A.J.; Rasmussen, F. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. Contract ENS-1364/93-0001. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

This paper describes the work of the JOULE II project 'Dynamic Stall and Three-Dimensional Effects'. An overview of the work is given. The goal of this project is to produce engineering methods for the calculation of stalled flow of horizontal axis wind turbines. Engineering methods in this context means that the methods should be suitable for implementation in current programs for aeroelastic calculations. The project is divided into three tasks: 1. Experiments. 2. Calculations with codes that can give detailed information on the flow of a stalled rotor and development. 3. Engineering methods. Experimental results for the 75% radius of wind turbines are presented and discussed. 3D calculations are shown to be able to predict the static stall delay at small radius of the turbine. Calculations with three dynamic stall models are shown to give good agreement with measurements on a NACA 43415, a LS(1)-0421 MOD and a SERI 809 aerofoil. (au) (17 refs.)

15356 (RISO-R–797(EN), pp. 66-71) **A comparative study between a dynamic stall model and experiments on a HAWT.** Christensen, H.F. (Risoe National Lab., The Department for Meteorology and Wind Energy, Roskilde (Denmark)); Soerensen, N.N.; Chaviaropoulos, P. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. Contract ENS-1364/93-0001. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

In the mid and late eighties experimental campaigns were initiated in different countries. In order to investigate some earlier findings concerning the importance of the 3D, rotaional and unsteady effects on the operational characteristics of HAWTs working in natural conditions. The above measurements as well as some more recent measurements show clearly that the 3D, rotational and unsteady effects, are indeed the source of the uncertainty in modelling and predicting the aerodynamic loads on the HAWTs. In order to investigate one of the above mentioned topics we are attempting in this paper to model the unsteady effects in the stalled regime aiming to the understanding of the related physics. A dynamic stall model which is based on a 3 D primitive variables Navier-Stokes solver is used for this reason. Numerical results are compared against experimental and computational results of the open literature, as well as against the experimental results for a HAWT setup. (au) (19 refs.)

15357 (RISO-R–797(EN), pp. 72-78) **Influence of transversal turbulence on lifetime predictions for a HAWT.** Thirstrup Petersen, J. (Risoe National Lab., Department of Meteorology and Wind Energy, Roskilde (Denmark)); Kretz, A.; Mann, J. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The paper presents work concerned with investigation of the quality of synthetic generated turbulence used as input to aeroelastic simulation programs. Measured and synthetic turbulence generated by two models, which basically differ in the number of represented wind components, is compared. The turbulence is represented as the local wind vector at a cross section of a rotating wind turbine blade in natural wind. The results confirm that the transversal turbulence component is important for realistic representation of the local wind vector and subsequently for derived quantities as e.g. fatigue damage. (au)

15358 (RISO-R–797(EN), pp. 79-85) **Experimental and numerical results for a series of tip shapes.** Antoniou, I. (Risoe National Lab., Dept. of Meteorology and Wind Energy, The Test Station for Wind Turbines, Roskilde (Denmark)); Aagaard Madsen, H.; Schmidt Paulsen, U. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The blade tip region is of high importance for the rotor power production, the blade loading and the noise emission. Wind turbine performance can thus be significantly influenced (improved) by the choice of the right tip shape. In this report experimental and numerical results are presented. The experimental results comprise load and inflow measurements conducted on a 100 kW wind turbine Tellus T-1995 which has been used as a test bed. The results

from the different tips are to be compared to those of the rotor's standard tip. The numerical results presented have been reached by using the commercial Navier-Stokes code FIDAP and comprise calculations of the laminar flow field around the tips. (au) (11 refs.)

15359 (RISO-R–797(EN), pp. 86-96) **Concept testing of wind turbines.** Paulsen, U.S. (Risoe National Lab., The Test Station for Wind Turbines, Roskilde (Denmark)); Larsen, G.C.; Petersen, S.M.; Pedersen, T.F. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The Danish certification system for wind turbines has requirements to testing of wind turbines which is described as basic and system testing. It has been the practice in the past few years that the loads on the 500 kW wind turbine generation were verified for each wind turbine type by measurements, which has meant system testing of quite a number of wind turbines. Therefore, it was decided to put up a testing program that incorporates calculations with aeroelastic codes into the certification process. The present paper describes a testing procedure, called concept testing, which is based on the applicability of aeroelastic codes to reduce the number of system tests necessary to perform on wind turbines of the same concept. (au)

15360 (RISO-R–797(EN), pp. 97-99) **Spot check on operating wind turbines.** Hjuler Jensen, P. (Risoe National Lab., Dept. of Meteorology and Wind Energy, The Test Station for Wind Turbines, Roskilde (Denmark)); Krogsgaard, J. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

As a part of the Danish Type approval and certification system for wind turbines, the Test Station for Wind Turbines has since 1988 been doing spot checks on randomly selected wind turbines that have been approved and erected in Denmark. This paper describes the objectives, procedures, methods, results and the considerable experience obtained with this type of tests. (au)

15361 (RISO-R–797(EN), pp. 100-106) **Structural loads in large wind farm arrays.** Frandsen, S. (Risoe National Lab., Meteorology and wind Energy Dept., Test Station for Wind Turbines, Roskilde (Denmark)); Christensen, C.J. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

In this paper we analyze the change of fatigue loading caused by the wind farm itself by comparing the so called equivalent load on a wind turbine at the edge of the wind farm to one placed deep inside the wind farm. Before that, we analyze the change inflow conditions inside and outside the wind farm by comparing wind speed and turbulence measurements from the two meteorological towers erected for the purpose. (au)

15362 (RISO-R–797(EN), pp. 107-111) **Vindeby offshore wind farm - fatigue loads.** Frandsen, S. (Risoe National Lab., Dept. of Meteorology and Wind Energy, Test Station for Wind Turbines, Roskilde (Denmark)); Christensen, C.J. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The main objectives of the project are to (1) complement the existing base of wind farm data by gathering information on wind speed deficit, turbulence and structural loads at the Vindeby offshore wind farm to investigate the structure of single and multiple wakes under the ideal homogeneous, low-ambient turbulence conditions found offshore, and thus be able to model wake behavior more correctly, and (2) to be able to characterize turbulence and shear in the incoming flow as a function of upstream turbine separation to be utilized in design standards for calculation of loads on wind turbines to be located offshore. From a statistical point of view few data are a present available. However, it is possible to get some indications of the flow environment in and around the wind farm. First, we take a brief look at some efforts made in modelling wind speed deficit and turbulence increase in wind farms and thus what could be expected in the presumed low-turbulence flow at sea. Secondly, measurements of wind speeds and turbulence mad at the two offshore meteorological towers is presented, and finally measurements of the so-called equivalent stress width - calculated from flapwise root bending moments of the two instrumented wind turbines - are presented. (au)

15363 (RISO-R–797(EN), pp. 112-117) **High wind energy penetration systems planning.** Hansen, J.C. (Risoe National Lab., Dept. of Meteorology and Wind Energy, The Test Station for Wind Turbines, Roskilde (Denmark)); Giaever Tande, J.O. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

Power system expansion planning should determine the optimal power system mix including wind power, ideally containing cost of energy comparisons as well as estimates of economics for the society, including externalities. The analyses should be made for all relevant expansion scenarios supplying power at similar and acceptable reliability throughout the lifetime of equipment. This paper addresses the requirements to modelling in general and suggests a modelling approach attempting to take adequate account of statistical variations and uncertainties in input and assumptions as well as influence of future development scenarios. The paper particularly studies the question whether a change of or large uncertainty in the assumed development of consumer loads over a 20 year period has or should have an influence on decisions to invest in wind power capacity up to high penetration levels. A dedicated model for power system performance modelling when studying the impact of wind power up to high penetration levels, WINSYS, is presented and described in the paper. Recommendations regarding need for methodologies for studying system expansions with wind power are discussed for both small and large power systems. (au)

15364 (RISO-R–797(EN), pp. 118-124) **On power quality measures for wind-diesel systems. A conceptual framework and a case study.** Bindner, H.W. (Risoe National Lab., Test Station for Wind Turbines, Roskilde (Denmark)); Lundager, P. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050–: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece.* 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

By their definition wind diesel systems are electrical power supply systems with variations of both voltage and frequency of the grid. In order to evaluate prospective systems designs in terms of power quality and compare with alternatives in a rational way it is necessary to work within an agreed framework of definitions of the measures to be applied. This paper contributes to the development by presenting a conceptual framework for power quality in terms of

both grid frequency and voltage in a time scale, where system dynamics in the usual sense is included, but switching and harmonics are not considered. Concerning voltage variations the proposed framework rests on previous work (e.g. CENELEC) and current work (DEFU/Risoe and Mayer/Joule II), and the main contribution of this paper concerns frequency variations. The framework consists of definitions of power quality measures, a set of criteria for the power quality and a technique for modelling the system. In addition to this, when possible, measurements are made to calibrate the model or verify the predicted behaviour of the system. The definitions are based on statistical measures for the frequency of occurrence of instantaneous and mean values. The paper will outline criteria in a qualitative way. The modelling technique referred to in the paper is the one used in the JODYMOD Dynamic Wind Diesel Simulation Package, developed by European team with support from the JOULE I programme. The paper includes a case study, in which the fram work is applied on the simple and robust experimental wind diesel system at Risoe National Laboratory. (au)

15365 (RISO-R--797(EN), pp. 125-130) **Engineering design tools for wind diesel - summary of first release version.** Infield, D.G. (Loughborough University (United Kingdom)); Scotney, A.; Lundsager, P.; Bindner, H.; Uhlen, K.; Toftevaag, T.; Pierik, J.T.G.; Dijk, V.A.P. van; Manninen, L.; Falchetta, M. Risoe National Lab., Roskilde (Denmark). Meteorology and Wind Energy. Jan 1995. (CONF-941050--: EWEC'94: 5. European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). In *Contributions from the Department of Meteorology and Wind Energy to the EWEC'94 conference in Thessaloniki, Greece*. 136p. Order Number DE95766441. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

A user-friendly software package to help engineers design wind diesel systems has been developed over the last three years with support from the CED's JOULE programme. Such systems have an important role to play in the supply of electricity to rural, grid remote sites. The modelling and software development was undertaken cooperatively by several EEC and EFTA countries. Both logistic and dynamic aspects of system operation are included in the final package which has been written for implementation on a PC running under MSDOS. This paper describes the modelling capabilities and validation of these engineering tools. (au)

1707 Health and Safety

Refer also to citation(s) 15352

20 FOSSIL-FUELED POWER PLANTS

2001 Power Plants and Power Generation

Refer also to citation(s) 14725, 14772, 14774, 14788, 15613

15366 (DOE/CE/15604--T2) **Coal air turbine "CAT" program: Invention 604. Second quarterly report, January 1995--March 1995.** Foster-Pegg, R.W. Foster-Pegg (Richard W.), West Chester, PA (United States). 28 Apr 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15604. Order Number DE95010373. Source: OSTI; NTIS; GPO Dep.

The primary objective of this 'CAT' project is to complete a conceptual design of this unique new combination of existing technology with cost estimates to show that the CAT system offers the economic incentive with low technical risk for a plant to be built which will demonstrate its viability. The technologies involved in the components of a CAT plant are proven, and the integration of the components into a complete plant is the only new developmental activity involved. Industry and the Federal General Services Administration (GSA), require the demonstration of a commercial plant before the viability of a new concept is accepted. To satisfy this requirement the construction of a plant of commercially viable size in excess of 15 MW if cogeneration and above 30 MW if all power, is proposed. This plant will produce economical power and heat for the owner. The plant will operate for a full commercial life and continue as an operating demonstration of the viability of the technology, gathering long term life and maintenance data, all adding to the credibility of the concept.

15367 (DOE/MC/10637--3292) **Project Calcium.** Hurley, J.P.; Benson, S.A.; Erickson, T.A.; Allan, S.E.; Bieber, J. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Sep 1992. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC10637. Order Number DE95000069. Source: OSTI; NTIS; GPO Dep.

Fouling problems in utility boilers have been classified into two principal types: high-temperature and low-temperature fouling. A multiclient-sponsored program was initiated at the Energy and Environmental Research Center (EERC) to better understand the causes of low-temperature fouling when burning high-calcium western US coals. The goals of Project Calcium were to define the low-temperature deposition problem, identify the calcium-based components that are responsible for the formation of the deposits, develop ways to predict their formation, and identify possible methods to mitigate the formation of these deposits. To achieve the goals of Project Calcium, detailed sampling of utility boilers and laboratory-scale studies coupled with state-of-the-art methods to determine the inorganic components in coals and coal ash-derived materials were conducted. Boiler Sampling was also performed. The work involved sampling coal, entrained ash, deposits and slags from five full-scale utility boilers combined with detailed advanced characterization of the materials. The results of this work aided in identifying the key phenomena to focus the laboratory studies and in model verification. Field testing was conducted at three utilities.

15368 (DOE/MC/29257--95/C0410) **Rugged ATS turbines for alternate fuels.** Wenglarz, R.A.; Nirmalan, N.V.; Daehler, T.G. Allison Engine Co., Indianapolis, IN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC29257. (CONF-950629--1: ASME international gas turbine and aeroengine congress and exposition: land, sea and air, Houston, TX (United States), 5-8 Jun 1995). Order Number DE95005954. Source: OSTI; NTIS; GPO Dep.

A major national effort is directed to developing advanced turbine systems designed for major improvements in efficiency and emissions performance using natural gas fuels. These turbine designs are also to be adaptable for future operation with alternate coal and biomass derived fuels. For several potential alternate fuel applications, available hot gas cleanup technologies will not likely be adequate to protect the turbine flowpath from deposition and corrosion. Past tests have indicated that cooling turbine airfoil surfaces could ruggedized a high temperature turbine flowpath to alleviate deposition and corrosion. Using this specification. ATS turbine that was evaluated. The initial analyses also showed that two-phase cooling offers the most attractive method of those explored to protect a coal-fueled ATS turbine from deposition and corrosion. This paper describes ruggedization approaches, particularly to counter the extreme deposition and corrosion effects of the high inlet temperatures of ATS turbines using alternate fuels.

15369 (DOE/MC/30246--3973) **Advanced turbine systems program conceptual design and product development. Annual report, August 1993--July 1994.** Solar Turbines, Inc., San Diego, CA (United States). Nov 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30246. Order Number DE95000057. Source: OSTI; NTIS; GPO Dep.

This Yearly Technical Progress Report covers the period August 3, 1993 through July 31, 1994 for Phase 2 of the Advanced Turbine Systems (ATS) Program by Solar Turbines Incorporated under DOE Contract No. DE-AC421-93MC30246. As allowed by the Contract (Part 3, Section J, Attachment B) this report is also intended to fulfill the requirements for a fourth quarterly report. The objective of Phase 2 of the ATS Program is to provide the conceptual design and product development plan for an ultra-high efficiency, environmentally superior and cost-competitive industrial gas turbine system to be commercialized in the year 2000. During the period covered by this report, Solar has completed three of eight program tasks and has submitted topical reports. These three tasks included a Project Plan submission of information required by NEPA, and the selection of a Gas-Fueled Advanced Turbine System (GFATS). In the latest of the three tasks, Solar's Engineering team identified an

intercooled and recuperated (ICR) gas turbine as the eventual outcome of DOE's ATS program coupled with Solar's internal New Product Introduction (NPI) program. This machine, designated "ATS50" will operate at a thermal efficiency (turbine shaft power/fuel LHV) of 50 percent, will emit less than 10 parts per million of NOx and will reduce the cost of electricity by 10 percent. It will also demonstrate levels of reliability, availability, maintainability, and durability (RAMD) equal to or better than those of today's gas turbine systems. Current activity is concentrated in three of the remaining five tasks a Market Study, GFATS System Definition and Analysis, and the Design and Test of Critical Components.

15370 (DOE/MC/30247–3999) **Advanced turbine systems program conceptual design and product development. Quarterly report, August–October 1994.** Westinghouse Electric Corp., Orlando, FL (United States). Power Generation Business Unit. Dec 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30247. Order Number DE95000064. Source: OSTI; NTIS; GPO Dep.

This is a quarterly report on the Westinghouse Electric Corporation Advanced Turbine Systems Program–conceptual design and product development. The topics of the report include the management plan, National Energy Policy Act, selection of natural gas-fired advanced turbine systems, selection of coal-fired advanced turbine systems, market study, systems definition and analysis, design and test of critical components, and plans for the next reporting period.

15371 (DOE/PC/91162–T12) **Development & testing of industrial scale, coal fired combustion system, Phase 3. Eleventh quarterly technical progress report, July 1, 1994–September 30, 1994.** Zauderer, B. Coal Tech Corp., Merion Station, PA (United States). 15 Nov 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91162. Order Number DE95009357. Source: OSTI; NTIS; GPO Dep.

The primary objective of the present effort is to perform the final testing, at a 20Mmbtu/hr commercial scale, of an air cooled, slagging coal combustor for application to industrial steam boilers and power plants. The focus of the test effort is on combustor durability, automatic control of the combustor's operation, and optimal environmental control of emissions inside the combustor.

15372 (SVF–535) **Study of operating experiences from modern diesel engine based cogeneration plants at Oskarshamn and Linkoeping.** Oeberg, R. (Sydkraft Konsult, Malmoe (Sweden)); Dalerhult, F. Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 105p. (In Swedish). Project Vaermeforsk-E1-205. Order Number DE95766642. Source: OSTI; NTIS.

The conclusions that can be made from the data that have been aquisited during the project are: - It has not been possible to identify any differences in performance or availability between the two plants that are related to the different fuel types. This is also in accordance with what could be expected, as the engine type is basically designed for operation on heavy fuel oil. - The test that have been performed with LPG indicate that the NO_x emissions from the engine are reduced as compared to emissions with light fuel oil. - The availability on both plants has been in the range 85-93% during the first season of operation in spite of the commissioning related problems that occurred during this period. The availability can be expected to increase, which is indicated by the fact that the Oskarshamn plants has had an availability of 97% during the last operating season. - The operational- and maintenance costs are 0.07 SEK/kWh_{E1} in both plants. - Similar problems have occurred in both plants, i.e. dust contamination in the SCR-units, leakages in the cooling water system, the piston rods had to be replaced. - The 'commissioning related' problems described above, has influenced the evaluation of plant availability, operations- and maintenance costs etc. This has had some influence on the accuracy of the conclusions that can be made from the first operational seasons. It is however very likely that the following operational seasons will give lower operation- and maintenance costs and higher availability, for instance due to the fact that the operators will gain more experience with the plants. - In order to get statistically relevant and 'typical' data it is advisable to increase the study so that it also will cover one or two more operational seasons. Figs, tabs, and photos

15373 (SVF–536) **Superheater material test of the compound tubes in a 65 MW_{th} PYROFLOW CFB boiler.** Peltola, K. (Hans Ahlstrom Laboratory (Finland)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 65p. (In English, Swedish). Project Vaermeforsk-M1-303. Order Number DE95766643. Source: OSTI; NTIS.

A one-year test on four seamless composite tubes was carried out in a 65 MW_{th} Ahlstrom PYROFLOW boiler. The composite tubes of SANDVIK FECRAL/HT8 were installed in the hot end of the final superheater (SH III). The clad metal FECRAL on the base metal 10CrMo910 has two different Si contents; FECRAL0 0.29 w-% and FECRAL1 1.04 w-%. These samples of the two similar kinds of composite tubes were installed for parallel tests. Besides, the reference test tubes 13CrMo44 and 10CrMo910 were welded into SH III. The boiler is a Circulating Fluidized Bed (CFB) boiler. The steam is used for electricity generation, and in the paper mill. During the test the main daily steam generation varied between 8 and 19 kg/s. The mean temperature of the steam was 470 degrees C and the mean pressure was 80 bar. The co-combustion of Refuse Derived Fuel (RDF) started in September 1993. The main fuels used in the boiler were peat and coal. Approximately 30 tons of RDF was co-combusted daily until June 1994. The total test time in hot flue gas conditions was 7900 hours. The RDF proportion of the thermal energy input into the boiler was 10%, (i.e. 15 w-% of wet fuels) on a monthly basis. The actual combustion time of one truck load was from 10 to 12 hours. Consequently, the estimated continuous test time in RDF combustion for the tubes was 2500 hours, i.e. 25 to 30% of the thermal energy input. According to the measurements the corrosion rate was not significantly increased by the RDF co-combustion. Also the fouling tendency of the boiler was quite normal. In the basis of the test, the FeCrAl compounds tubes are more resistant to hot corrosion than the reference tubes. Figs, tabs

2002 Waste Management

Refer also to citation(s) 14750, 14755, 14758, 14759, 14760, 14761, 14762, 14763, 16497

15374 (DOE/PC/90361–T16) **Catalytic fabric filtration for simultaneous NO_x and particulate control. Final report.** Weber, G.F.; Dunham, G.E.; Laudal, D.L.; Ness, S.R.; Schelkoph, G.L. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Aug 1994. 414p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90PC90361. Order Number DE95004259. Source: OSTI; NTIS; GPO Dep.

The overall objective of the project proposed was to evaluate the catalyst-coated fabric filter concept for effective control of NO_2 and particulate emissions simultaneously. General goals included demonstrating high removal efficiency of NO_x and particulate matter, acceptable bag and catalyst life, and that process economics show a significant cost savings in comparison to a commercial SCR process and conventional particulate control. Specific goals included the following: reduce NO_x emissions to 60 ppM or less; demonstrate particulate removal efficiency of >99.5%; demonstrate a bag/catalyst life of >1 year; Control ammonia slip to <25 ppM; show that catalytic fabric filtration can achieve a 50% cost savings over conventional fabric filtration and SCR control technology; determine compatibility with $S0_2$ removal systems; and show that the concept results in a nonhazardous waste product.

15375 (DOE/PC/92521–T214) **Production and use of activated char for combined SO_2/NO_x removal. [Quarterly] technical report, September 1–November 30, 1994.** Lizzio, A.A. (Illinois State Geological Survey (United States)); DeBarr, J.A.; Donnals, G.L.; Feizoulof, C.A.; Kruse, C.W.; Lytle, J.M.; Rood, M.J.; Gangwal, S.K.; Honea, F. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1994]. 27p. Sponsored by USDOE, Washington, DC (United States);Illinois Clean Coal Inst., Carterville, IL (United States);Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). DOE Contract FC22-92PC92521. Order Number DE95008000. Source: OSTI; NTIS; GPO Dep.

Carbon adsorbents have been shown to remove sulfur oxides from flue gas, and also serve as a catalyst for reduction of nitrogen oxides at temperatures between 80 and 150°C. The overall objective of this project is to determine whether Illinois coal is a suitable feedstock for the production of activated char which could be used as a catalyst for combined SO_2/NO_x removal, and to evaluate the potential application of the products in flue gas cleanup. During this quarter, further analyses of SO_2 adsorption and TPD data revealed that SO_2 adsorption was directly proportional to the number of unoccuppied (free) adsorption sites on the carbon surface. The SO_2 capacity of a series of prepared IBC-102 chars and commercial activated carbons normalized with respect to the number of free sites varied by less than a factor of two, which indicated an excellent correlation. Based on these results, a mechanism for SO_2 adsorption on carbon and conversion to H_2SO_4 was proposed. To study NO_x reduction by activated char, a packed bed flow through system was designed and constructed. A quadrupole mass spectrometer was installed to monitor the [NO] and [NO_2]; NO breakthrough curves were obtained for a commercial activated carbon at various [NO].

2005 Environmental Aspects

Refer also to citation(s) 14794, 15651

2006 Economic, Industrial, and Business Aspects

Refer also to citation(s) 14790, 15366, 17405

15376 (NEI-NO–505) **Natural gas for power generation. Prospects and limitations.** McNair, L.K. (National Power PLC (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 7p. (CONF-9408229–12: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766581. Source: OSTI; NTIS; INIS.

The conference paper discusses prospects and limitations on natural gas power generation and supply in United Kingdom. Some aspects on power distribution to Europe are dealt with.

15377 (NEI-NO–506) **Norwegian gas supplies for the European market.** Hansen, B.L. (Norsk Hydro A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 14p. (CONF-9408229–13: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766582. Source: OSTI; NTIS; INIS.

The conference paper deals with the Norwegian key role in the European gas market with increasing market shares. The supply capacity in a long-term perspective can be 65-70 bcm/year or more if export prices support the development of new and more costly gas resources. The main challenges for the Norwegian shelf are discussed. 5 figs.

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

Refer also to citation(s) 15482, 15483, 15484, 15485, 15486, 15489, 15490, 15491, 15493, 15494, 15496, 15498, 15500, 15501, 15502, 15503, 15504, 15505, 15506, 15508, 15509, 15510, 15511, 15512, 15513, 15514, 15515, 15516, 15517, 15518, 15519, 15520, 15521, 15522, 15523, 15524, 15525, 15526, 15527, 15528, 15529, 15530, 15531, 15532, 15533, 15535, 15537, 15538, 15539, 15541, 15542, 15543, 15544, 15546, 15547, 15548, 15549, 15550, 15551, 15552, 15553, 15554, 15555, 15556, 15558, 15559, 15560, 15561, 15562, 15563, 15565, 15566, 15567, 15568, 15569, 15580

15378 (AEC–95010510) **Civilian Power Program. Part 1, Summary, Current status of reactor concepts.** USAEC Division of Reactor Development, Washington, DC (United States). 1 Sep 1959. 263p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010510. Source: OSTI; NTIS; GPO Dep.

This study group covered the following: delineation of the specific objectives of the overall US AEC civilian power reactor program, technical objectives of each reactor concept, preparation of a chronological development program for each reactor concept, evaluation of the economic potential of each reactor type, a program to encourage the the development, and yardsticks for measuring the development. Results were used for policy review by AEC, program direction, authorization and appropriation requests, etc. This evaluation encompassed civilian power reactors rated at 25 MW(e) or larger and related experimental facilities and R&D. This Part I summarizes the significant results of the comprehensive effort to determine the current technical and economic status for each reactor concept; it is based on the 8 individual technical status reports (Part III).

15379 (IAEA-SM–317/33) **PC version of PRIS (Power Reactor Information System).** Fukala, J. (Nuclear Information Centre, Prague (Czech Republic)); Stanik, Z.; White, D. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 8p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628745. Source: OSTI; NTIS (US Sales Only); INIS.

The IAEA has been collecting operating experience data on nuclear power plants in the Member States since 1970. In 1980 a computerized database was established, the IAEA Power Reactor Information System (PRIS). To make PRIS data available to the Member States in a more convenient format, the development of a PC version of PRIS started in 1989.

15380 (INIS-JP–031) **Present status of nuclear power safety studies in JAERI, 1994.** Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment. Oct 1994. 114p. (In Japanese). Order Number DE95768238. Source: OSTI; NTIS; INIS.

Securing safety in the development and utilization of nuclear power is the prerequisite, and in order to maintain the safety of nuclear power facilities at level corresponding to the expansion and diversification of nuclear power development and utilization, it is necessary to promote the safety research. The reliable evaluation of environmental effect and the safe disposal of radioactive waste are the indispensable conditions. Japan Atomic Energy Research Institute has carried out the research on the engineering safety of nuclear reactors and nuclear fuel cycle facilities and the research on the environmental safety related to environmental radiation and the treatment and disposal of radioactive waste. In this book, the researches on the safety of reactor fuel, the reliability of reactor machinery and equipment and structures, the thermo-hydraulic behavior of reactors at the time of accidents, the behavior of reactors at the time of severe accidents, the analytical research on the safety of reactors, the researches on the safety of nuclear fuel cycle, the treatment and disposal of radioactive waste, the assessment and analysis of environmental radiation and radioactivity, and the individual researches related to nuclear power safety are reported. (K.I.).

15381 (NUREG–0020-Vol.19) **Licensed operating reactors. Status summary report data as of 12-31-94: Volume 19.** Nuclear Regulatory Commission, Washington, DC (United States). Office of Information Resources Management. Apr 1995. 343p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

The Nuclear Regulatory Commission's annual summary of licensed nuclear power reactor data is based primarily on the report of operating data submitted by licensees for each unit for the month of December because that report contains data for the month of December, the year to date (in this case calendar year 1994) and cumulative data, usually from the date of commercial operation. The data is not independently verified, but various computer checks are made. The report is divided into two sections. The first contains summary highlights and the second contains data on each individual unit in commercial operation. Section 1 capacity and availability factors are simple arithmetic averages. Section 2 items in the cumulative column are generally as reported by the licensee and notes as to the use of weighted averages and starting dates other than commercial operation are provided.

2101 Power Reactors, Nonbreeding, Light-Water Moderated, Boiling Water Cooled

Refer also to citation(s) 14935, 14937, 15396, 15399, 15405, 15454, 15499, 15604, 15608, 15890

15382 (DOE/ER/75788–1) **Nonlinear stability models and analyses of the nuclear-coupled thermal-hydraulic behavior of boiling water reactors. Interim report, October 1, 1992–May 30, 1993.** Dorning, J.J. Virginia Univ., Charlottesville, VA (United States). Dept. of Mechanical, Aerospace and Nuclear Engineering. May 1993. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-92ER75788. (UVA–527484/MANE93/101). Order Number DE95010153. Source: OSTI; NTIS; INIS; GPO Dep.

All the objectives originally scheduled for the first year of this grant have been achieved. Furthermore, the project is ahead of schedule, in that a substantial amount of work has been completed on two significant objectives originally planned for the second year. This interim report is divided into five parts, summarizing the mathematical development, analysis and results of the project goals – goals originally planned for the first year and completed, and those on which substantial progress has been made ahead of schedule. Effects of unheated riser sections and the downcomer recirculation loop on the stability characteristics of advanced boiling water reactor designs that incorporate risers or unheated channel extensions are summarized in Part A. Such extensions are incorporated above the heated reactor core channels to enhance buoyancy-driven natural thermal convection both during normal at-power operation and during emergency shutdown. The effects of both, the inclusion of unheated riser sections in the designs (one of the goals substantially completed ahead of schedule), and the inclusion of the recirculation loop in the models (first year goal) were generally found to be destabilizing. In general, as riser lengths were increased equilibria that previously were stable became unstable, and the systems with the taller risers evolved to density-wave limit cycle oscillations. As a building block of the second year goal – to extend the one dimensional dynamical analysis of reactor thermal-hydraulics/neutron-kinetics to two and three dimensions – we have carried out, ahead of schedule, the nonlinear dynamical analysis of two-phase flow in multiple parallel heated channels. Some basic aspects of bifurcation phenomena in two-phase flow and the related nonlinear dynamics of single and multiple parallel, uniformly and nonuniformly heated channels are studied.

15383 (LTKK-TJ–41, pp. 159-169) **Research of severe accidents in Finland.** Mattila, L. (VTT Energy, Espoo (Finland)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

Research efforts aim to confirm and support the development and implementation of the severe accident management plans of the Finnish nuclear plants. At TVO (ABB Atom BWR) major issues to be confirmed are the failure mode of the reactor vessel and the cooling of the core debris in water filled cavity. At Loviisa (VVER-440 PWR), the plans include keeping the molten core materials within the reactor vessel by external flooding of the vessel and removing the long term decay heat from the containment by external spray of the containment steel shell. The scope of the Loviisa plant analyzer, implemented in the APROS simulation environment, is being extended to degraded core conditions with primarily training related aims. APROS modules are also being used in the development of computerized accident management support systems. (orig.) (6 refs., 34 figs.).

15384 (NUREG/CR–4667-Vol.18) **Environmentally assisted cracking in light water reactors. Semiannual report, October 1993–March 1994. Volume 18.** Chung, H.M. (Argonne National Lab., IL (United States)); Chopra, O.K.; Erck, R.A.; Kassner, T.F.; Michaud, W.F.; Ruther, W.E.; Sanecki, J.E.; Shack, W.J.; Soppet, W.K. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Argonne National Lab., IL (United States). Mar 1995. 51p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (ANL–95/2-Vol.18). Source: OSTI; NTIS; INIS; GPO.

This report summarizes work performed by Argonne National Laboratory (ANL) on fatigue and environmentally assisted cracking (EAC) in light water reactors (LWRs) during the six months from October 1993 to March 1994. EAC and fatigue of piping, pressure vessels, and core components in LWRs are important concerns in operating plants and as extended reactor lifetimes are envisaged. Topics that have been investigated include (a) fatigue of low-alloy steel used in piping, steam generators, and reactor pressure vessels, (b) EAC of wrought and cast austenitic stainless steels (SSs), and (c) radiation-induced segregation and irradiation-assisted stress corrosion cracking (IASCC) of Type 304 SS after accumulation of relatively high fluence. Fatigue tests have been conducted on A302-Gr B low-alloy steel to verify whether the current predictions of modest decreases of fatigue life in simulated pressurized water reactor water are valid for high-sulfur heats that show environmentally enhanced fatigue crack growth rates. Additional crack growth data were obtained on fracture-mechanics specimens of austenitic SSs to investigate threshold stress intensity factors for EAC in high-purity oxygenated water at 289°C. The data were compared with predictions based on crack growth correlations for wrought austenitic SS in oxygenated water developed at ANL and rates in air from Section XI of the ASME Code. Microchemical and microstructural changes in high- and commercial-purity Type 304 SS specimens from control-blade absorber tubes and a control-blade sheath from operating boiling water reactors were studied by Auger electron spectroscopy and scanning electron microscopy to determine whether trace impurity elements, which are not specified in the ASTM specifications, may contribute to IASCC of solution-annealed materials.

15385 (SAND–92-1231) **Assessment of ALWR passive safety system reliability. Phase 1: Methodology development and component failure quantification.** Hake, T.M. (Sandia National Labs., Albuquerque, NM (United States)); Heger, A.S. Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010401. Source: OSTI; NTIS; INIS; GPO Dep.

Many advanced light water reactor (ALWR) concepts proposed for the next generation of nuclear power plants rely on passive systems to perform safety functions, rather than active systems as in current reactor designs. These passive systems depend to a great extent on physical processes such as natural circulation for their driving force, and not on active components, such as pumps. An NRC-sponsored study was begun at Sandia National Laboratories to develop and implement a methodology for evaluating ALWR passive system reliability in the context of probabilistic risk assessment (PRA). This report documents the first of three phases of this study, including methodology development, system-level qualitative analysis, and sequence-level component failure quantification. The methodology developed addresses both the component (e.g. valve) failure aspect of passive system failure, and uncertainties in system success criteria arising from uncertainties in the system's underlying physical processes. Traditional PRA methods, such as fault and event tree modeling, are applied to the component failure aspect. Thermal-hydraulic calculations are incorporated into a formal expert judgment process to address uncertainties in selected natural processes and success criteria. The first phase of the program has emphasized the component failure element of passive system reliability, rather than the natural process uncertainties. Although cursory evaluation of the natural processes has been performed as part of Phase 1, detailed assessment of these processes will take place during Phases 2 and 3 of the program.

15386 (SKB-TR–94-20) **Technology and costs for decommissioning of Swedish nuclear power plants.** Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Jun 1994. 89p. Order Number DE95626856. Source: OSTI; NTIS; INIS.

The decommissioning study for the Swedish nuclear power plants has been carried out during 1992 to 1994 and the work has been led by a steering group consisting of people from the nuclear utilities and SKB. The study has been focused on two reference

plants, Oskarshamn 3 and Ringhals 2. Oskarshamn 3 is a boiling water reactor (BWR) and Ringhals 2 is a pressurized water reactor (PWR). Subsequently, the result from these plants have been translated to the other Swedish plants. The study gives an account of the procedures, costs, waste quantities and occupational doses associated with decommissioning of the Swedish nuclear power plants. Dismantling is assumed to start immediately after removal of the spent fuel. No attempts at optimization, in terms of technology or costs, have been made. The nuclear power plant site is restored after decommissioning so that it can be released for use without restriction for other industrial activities. The study shows that a reactor can be dismantled in about five years, with an average labour force of about 150 persons. The maximum labour force required for Oskarshamn 3 has been estimated to about 300 persons. This peak load occurred the first years but is reduced to about 50 persons during the demolishing of the buildings. The cost of decommissioning Oskarshamn 3 has been estimated to be about MSEK 940 in January 1994 prices. The decommissioning of Ringhals 2 has been estimated to be MSEK 640. The costs for the other Swedish nuclear power plants lie in the range MSEK 590-960. 17 refs, 21 figs, 15 tabs.

15387 (STUK-B-YTO–125) **Operation of Finnish nuclear power plants. Quarterly report 2nd quarter, 1994.** Tossavainen, K. (ed.). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Dec 1994. 27p. Order Number DE95626857. Source: OSTI; NTIS; INIS.

The report is published also in Finnish as report number STUK-B-YTO–122.

The four Finnish nuclear power plants were in power operation for the second quarter of 1994, with the exception of brief repair outages at Loviisa plant units, the annual maintenance outages of Olkiluoto units and a brief TVO II shutdown at Midsummer due to low electricity demand. The load factor average of the plant units was 85.0%. At Loviisa plant units, cracks were detected in a valve of a pipeline connecting to the primary circuit. Cracking in the same location at both plant units showed inspection programmes to be inadequate. The event was rated on the International Nuclear Event Scale (INES) at level 1. At TVO I, the neutron flux protection limit basic values of the reactor scram circuit which had been lowered for the duration of a test at the beginning of the annual maintenance outage, were not restored. The matter was found out during plant unit start-up when one scram system channel indicated initiation of protective action; the actual protective function did not occur, however, since it requires the activation of at least two channels. During another event at Olkiluoto, shutdown service water system reliability at both plant units was found to have been impaired by installation errors of the pressure difference limit switches of service water filters. Both events showed there are deficiencies in utility procedures and the events were rated as level 1 on the INES. Other exceptional events and observations in this quarter were level 0 on the INES scale. (5 figs., 4 tabs.).

15388 (UCRL-ID–119423) **Laboratory directed research and development on disposal of plutonium recovered from weapons. FY1994 final report.** Pitts, J.H.; Choi, J.S. Lawrence Livermore National Lab., CA (United States). 14 Nov 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010209. Source: OSTI; NTIS; INIS; GPO Dep.

This research project was conceived as a multi-year plan to study the use of mixed plutonium oxide-uranium oxide (MOX) fuel in existing nuclear reactors. Four areas of investigation were originally proposed: (1) study reactor physics including evaluation of control rod worth and power distribution during normal operation and transients; (2) evaluate accidents focusing upon the reduced control rod worth and reduced physical properties of PuO_2; (3) assess the safeguards required during fabrication and use of plutonium bearing fuel assemblies; and (4) study public acceptance issues associated with using material recovered from weapons to fuel a nuclear reactor. First year accomplishments are described. Appendices contain 2 reports entitled: development and validation of advanced computational capability for MOX fueled ALWR assembly designs; and long-term criticality safety concerns associated with weapons plutonium disposition.

2102 Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled

Refer also to citation(s) 14923, 14935, 15383, 15384, 15385, 15386, 15387, 15388, 15454, 15458, 15487, 15488, 15492, 15497, 15534, 15536, 15545, 15557, 15564, 15604, 15608, 15609, 15610, 15611, 15824, 15890

15389 (FZR–76) **1% cold leg break experiment on PMK-2. Test results and computer code analysis.** Ezsoel, G. (Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics); Guba, A.; Perneczky, L.; Prasser, H.M.; Schaefer, F. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Mar 1995. 44p. Order Number DE95768491. Source: OSTI; NTIS (US Sales Only); INIS.

In the framework of the computer code assessment programme for the VVER-440 type Paks Nuclear Power Plant a 1% cold leg break experiment has been conducted on the PMK-2 integral type test facility. It was followed by calculations using RELAP 5Mod3.1 and ATHLET in order to assess code capabilities. This experiment was started from the nominal operational parameters and it was considered that only the high pressure injection system (HPIS) is available and there is no injection from the safety injection tanks (SIT). This experiment was the repetition of the test measured in 1990, with improved data aquisition system. The first part of this report includes a short description of the facility, the measurement description, the test results including the local void measurement and a short interpretation of the main phenomena. In the second part of the report the analysis performed by the RELAP 5Mod3.1 and ATHLET Mod1.1 Cycle A codes are given. (orig.)

15390 (IVO-A–07/94) **The loadings and strength of nuclear power plant structures in core damage accidents.** Varpasuo, P. (Ivo International Oy, Vantaa (Finland)). Imatran Voima Oy, Vantaa (Finland). 1994. 116p. (In Finnish). Order Number DE95628753. Source: OSTI; NTIS; INIS.

The reactor cavity of VVER-91 NPP is a thick-walled, cylindrical reinforced concrete structure. In case of molten core-water reaction during the severe reactor accident the load carrying capacity of the cavity structure is of interest against the short impulse type loading caused by the steam explosion phenomenon. The assumed size of the impulse was 20 kPa-s and the duration was 10 ms. This investigation was divided in several phases. First, the elastic response of the cavity was determined using the ABAQUS code. Next, the static response of the cavity was evaluated using elasto-plastic properties of reinforcement and concrete and also taking into account the cracking of the concrete. This analysis was done with the aid of ABAQUS/STANDARD and ANSYS codes and the obtained results agreed reasonably with each other. In order to obtain a qualitative picture of the behaviour of the structure under the impulse load a simplified single degree of freedom model was developed. The hoop reinforcement of the cavity was taken as an elasto-plastic spring and the wall concrete acted as a mass. Using this model the suitable amount of hoop reinforcement was determined. In next phase, the dynamic analysis of the structure was attempted using elasto-plastic material properties and concrete cracking. (13 refs., 57 figs.).

15391 (KAPL–4798) **Residual stresses and stress corrosion cracking in pipe fittings.** Parrington, R.J.; Scott, J.J.; Torres, F. Knolls Atomic Power Lab., Schenectady, NY (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC12-76SN00052. (CONF-9409321–1: Fontevraud 3, Chinon (France), 12-16 Sep 1994). Order Number DE95009332. Source: OSTI; NTIS; INIS; GPO Dep.

Residual stresses can play a key role in the SCC performance of susceptible materials in PWR primary water applications. Residual stresses are stresses stored within the metal that develop during deformation and persist in the absence of external forces or temperature gradients. Sources of residual stresses in pipe fittings include fabrication processes, installation and welding. There are a number of methods to characterize the magnitude and orientation of residual stresses. These include numerical analysis, chemical cracking tests, and measurement (e.g., X-ray diffraction, neutron diffraction, strain gage/hole drilling, strain gage/trepanning, strain gage/section and layer removal, and acoustics). This paper

presents 400 C steam SCC test results demonstrating that residual stresses in as-fabricated Alloy 600 pipe fittings are sufficient to induce SCC. Residual stresses present in as-fabricated pipe fittings are characterized by chemical cracking tests (stainless steel fittings tested in boiling magnesium chloride solution) and by the sectioning and layer removal (SLR) technique.

15392 (LTKK-TJ–41, pp. 1-17) **VVER and RBMK reactors.** Valtonen, K. (Finnish Centre for Radiation and Nuclear Safety, Helsinki (Finland)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

The safety of VVER and RBMK reactors has been discussed a lot after Chernobyl accident. Some improvements have been performed since that especially in RBMK-reactors and extensive programmes for backfitting have been planned and are partly underway. There are two different sizes of VVER reactors, 440 MW and 1000 MW. The design bases and designs itself vary inside the family of two size classes depending on the age of the plant. The oldest VVER-440 is called model 230 and the newest model 213. The oldest VVER-1000 units (two units) are prototypes that have some unique, nonfavorable features. The next stage of VVER-1000 developement (three units) is model V-302 and the remaining 15 plants in operation are model V-320, but even within this latest model there are some differences. The design bases and designs vary also inside the family of the RBMK reactors exactly the same way as in VVERs. The most important design bases of nuclear power plants designed in the former Soviet Union is presented in this paper. Also some safety advantages and disadvantages of these NPPs are discussed. (au). (5 figs.).

15393 (LTKK-TJ–41, pp. 18-40) **Industrial safety studies for VVERs in FRAMATOME.** Gandrille, J.L. (Framatome, Paris (France)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

Since more than ten years, FRAMATOME has been involved in VVER activities, initiated by a comparison of Western and VVER plants, in the frame of a commercial proposal to Finnish customers in the early 80s. FRAMATOME is funding together with EDF and IPSN the development of the advanced thermalhydraulic code CATHARE. Currently available versions of CATHARE allow to perform best estimate calculations of LOCA accidents, small and large breaks, and non LOCA transients such as steam generator feedwater or steam line breaks, partial or total feedwater loss, steam generator tube ruptures, and other transients. CATHARE is used at FRAMATOME for all these transients in the frame of advanced methodologies for safety analysis, or for reference calculations. (au). (20 figs., 2 tabs.).

15394 (LTKK-TJ–41, pp. 88-96) **PACTEL - facility for VVER thermal hydraulics.** Kouhia, J. (VTT Energy, Espoo (Finland)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

The PArallel Channel TEst Loop (PACTEL) is a medium scale integral test facility (full height, volumetrically scaled, 1:305) designed to simulate thermal hydraulic phenomena characteristic of the VVER reactors with particular attention to the versions used in Finland. The PACTEL facility is located in Lappeenranta and it has been in operation since 1990. The facility was constructed by VTT Energy and Lappeenranta University of Technology. In the paper a short description of the PACTEL facility is given, as well as new steam generator model, which will replace the original PACTEL steam generator models. A measurement instrumentation is presented briefly. As an example of the investigations made so far, some findings of two test series to study the behaviour natural circulation over a range of primary side inventories are shown. (4 refs., 6 figs., 1 tab.).

15395 (LTKK-TJ–41, pp. 97-115) **High burn-up fuel and reactivity accident.** Latche, J.C. (Inst. de Protection et de Surete Nucleaire (France)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

A research program regarding the consequences of a Reactivity Initiated Accident occurring in PWRs is at present time carried out at the Nuclear Protection and Safety Institute (IPSN). It is specially devoted to the study of the behaviour of highly irradiated fuel during fast power transients such as control rod ejections. The study progresses in two fronts: (1) an experimental program will be performed in the CABRI facility, (2) a computer code, namely SCANAIR, is being developed. After validation on the available tests, this code must allow a reliable extrapolation to the reactor case. Both SCANAIR code and CABRI program and first results are presented.

15396 (LTKK-TJ–41, pp. 116-158) **Overview of severe accident research at the Nuclear Protection and Safety Institute of CEA.** Porracchia, A. (Inst. de Protection et de Surete Nucleaire (France)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

After the Three Mile Island and Chernobyl accidents, the possibility that an accident exceeds the design basis accident, commonly adopted, had to be addressed by severe accident reasearch programmes. Therefore, the understanding of phenomena occurring during Light Water Reactor severe accidents has become an important task in the nuclear safety research. In numerous countries, both experimental and analytical studies have been conducted in order to try to model these phenomena with a sufficient level of confidence. At the Nuclear Protection and Safety Institute (IPSN) of the French Commissariat a l'Energie Atomique (CEA), experiments along with code developments are being performed since the beginning of the eighties. As far as computer codes are concerned, IPSN has followed the general two-tier approach pursued worldwide for severe accident code development, i.e. integral codes and detailed mechanistic codes. At IPSN, the ESCADRE system is being developed as an integral code for the calculation of whole accidental sequences. The code can be used starting from the core uncovery up to the fission product release outside the plant containment. The beginning of the accidental sequence has to be calculated by a thermalhydraulic code (CATHARE is used in IPSN). In parallel to this development, IPSN is preparing the ICARE code as a detailed mechanistic code for studying the in-vessel core degradation up to the lower head failure. (43 figs.).

15397 (LTKK-TJ–41, pp. 170-197) **Review of main activities concerning computer codes used for VVER thermal-hydraulic safety analyses in OKB Gidropress.** Volkov, B. (OKB Gidropress, Podolsk (Russian Federation)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

The most important features of activities concerning DINAMIKA, TETCH and other computer codes used for VVER thermal-hydraulic safety analyses in OKB Gidropress are reviewed. The problems of validation of these codes for VVER NPP transients and accident evaluation are considered. (au) (6 refs., 27 figs.).

15398 (LTKK-TJ–41, pp. 198-242) **APROS computer code, new developments.** Haenninen, M. (VTT Energy, Espoo (Finland)). Lappeenranta Univ. of Technology (Finland). 1994.

(CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

The advanced PROcess Simulation environment (APROS) has been developed by Imatran Voima Oy and Technical Research Centre of Finland since 1986. It provides physical models, solution algorithms and process components to be used in different simulation systems for design, analysis and training purposes. The APROS simulation model library contains several physical models, of which a user may choose proper models depending on the application. The possibility to use process components and the graphical user interface makes the use of APROS efficient and easy. The process component, the user interface and physical simulation models are briefly described in the paper. The validation of the present models are discussed and the nuclear applications are presented. (51 figs.).

15399 (LTKK-TJ–41, pp. 243-250) **HEXTRAN - a 3-D reactor dynamics code for VVER accident analysis.** Kyrki-Rajamaeki, R. (VTT Energy, Espoo (Finland)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

The reactor dynamics calculation system of VTT Energy consists of models for both reactor types in Finland - the ABB Atom type BWRs in Olkiluoto and the VVER type PWRs in Loviisa. HEXTRAN is a three-dimensional hexagonal transient and accident analysis code developed in VTT for VVERs. Now it is possible to make fully realistic accident analyses starting from accurate core conditions. The thermal hydraulics model SMABRE is dynamically coupled with HEXTRAN for the primary and secondary circuit calculations. HEXTRAN coupled with SMABRE has been extensively applied to safety analyses of the Loviisa power station, of the new Russian VVER-91 concept, and of the Hungarian VVER-440 type NPP Paks. Main applications are the calculations of asymmetric accidents in the reactor core originating from neutronic or thermal hydraulic disturbances in core or cooling circuits. The main properties of HEXTRAN, its applications and plans for the development of its hydraulics model are presented in the paper. (14 refs., 2 figs.).

15400 (LTKK-TJ–41, pp. 251-258) **An overview the boron dilution issue in PWRs.** Hyvaerinen, J. (Finnish Centre for Radiation and Nuclear Safety, Helsinki (Finland)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

The presentation is an overview of boron (boric acid) dilution in pressurized water reactors (PWRs). Boric acid has been widely used in PWRs as a dissolved poison, as one of the main reactivity controlling means, for a long time, from nearly but not quite from the beginning of the design, construction and operation of PWRs in the present-day sense. The specific safety issue, namely the risk of uncontrolled reactivity insertion due to inadvertent boron dilution, is discussed first, followed by a brief look on the history of boron usage in PWRs. A discussion of boron dilution phenomenology is presented next in general terms. Some particular concerns that boron dilution phenomena arouse in the minds of a regulator will also be presented before concluding with a brief look on the future of dissolved poisons. (11 refs.).

15401 (LTKK-TJ–41, pp. 259-264) **Boron mixing transients in a 900 MW PWR vessel for a reactor start-up operation.** Alvarez, D. (EDF/DER (France). National Hydraulics Lab.); Martin, A.; Schneider, J.P. Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

In 1991 a R and D action, based on numerical simulations and experiments on PWRs' primary coolant temperature or boron mixing capabilities, was initiated. The paper presents the test facility BORA-BORA (a 1/5th scaled mock-up of a 900MW PWR vessel) and the Thermalhydraulic Finite Element Code N3S used for 3D calculations performed on the accurate geometry of the plant. As a validation test case of these experimental and numerical tools, the results obtained on the primary coolant mixing capabilities in the vessel with the three loops balanced in mass flow rate are presented. The second part of the report deals with the mixing of a clear water plug in the vessel when a primary coolant pump start-up. The results are obtained in the mock-up in terms of boron concentration at the core inlet for several clear water plug volumes. The numerical results give the complete fluid flow and boron concentration pattern but comparisons were made at the core inlet. (orig.)(11 refs., 9 figs.).

15402 (LTKK-TJ–41, pp. 265-275) **Problem of boric acid dilution in IVO.** Savolainen, S. (Imatran Voima Oy, Loviisa (Finland)). Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

Boron dilution analysis has recently become one of the most interesting topics concerning to PWR safety. Dilution analyses have been mainly dealing with so called external dilution mechanisms and its reactor dynamic consequences. In the beginning of 1993 the Finnish Centre for Radiation and Nuclear Safety required Imatran Voima Oy to carry out additional studies concerning other possible boron dilution mechanisms, consequences and their mitigation. The present study mainly deals with inherent dilution processes during accident and transient conditions. In the first part of the project the studies are based mainly on deterministic study of physical phenomenon leading to inherent boron dilution. Analyses are continued with mixing analyses and finally reactor-dynamic consequences are determined based on analyzed thermal-hydraulic preconditions. Furthermore the preventative operational actions will be studied. The results will be included in the PSA study for Loviisa Power Plant. The object of the paper is to discuss the inherent boron dilution studies for Loviisa Power Plant. (orig.) (5 refs.).

15403 (NUREG–1517) **Report of the South Texas Project Allegations Review Team. Docket Nos. 50-498 and 50-499, Houston Lighting and Power Company et al.** Kokajko, L. (Nuclear Regulatory Commission, Washington, DC (United States)); Skay, D.; Wang, H.; Murphy, D. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Reactor Regulation. Mar 1995. 218p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This report provides the results of the South Texas Project Allegations Review Team of the US Nuclear Regulatory Commission. This team was formed to obtain and review allegations from individuals represented by three attorneys who had contacted Congressional staff members. The allegers were employed in various capacities at South Texas Project Electric Generating Station, licensed by Houston Lighting and Power Company, et al.; therefore, the allegations are confined to this site. The South Texas Project Allegations Review Team reviewed, referred, and dispositioned concerns related to discriminatory issues (harassment and intimidation), falsification of records and omission of information, and various technical issues. The team was able to substantiate certain technical issues of minor safety significance or regulatory concern at the South Texas Project facility, but it did not find widespread discriminatory practices such as harassment and intimidation.

15404 (NUREG/CR–5591-Vol.4-No.2) **Heavy-section steel irradiation program. Volume 4, No. 2. Semiannual progress report, April 1993–September 1993.** Corwin, W.R. (Oak Ridge National Lab., TN (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering Technology; Oak Ridge National Lab., TN (United States). Mar

1995. 46p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–11568/V4-N2). Source: OSTI; NTIS; GPO; INIS.

Maintaining the integrity of the reactor pressure vessel (RPV) in a light-water-cooled nuclear power plant is crucial in preventing and controlling severe accidents which have the potential for major contamination release. The RPV is the only key safety-related component of the plant for which a duplicate or redundant backup system does not exist. In particular, it is vital to fully understand the degree of irradiation-induced degradation of the RPV's fracture resistance which occurs during service, since without that radiation damage, it is virtually impossible to postulate a realistic scenario that would result in RPV failure. For this reason, the Heavy-Section Steel Irradiation (HSSI) Program has been established to provide a quantitative assessment of the effects of neutron irradiation on the material behavior and, in particular, the fracture toughness properties of typical pressure-vessel steels. Effects of specimen size; material chemistry; product form and microstructure; irradiation fluence, flux, temperature, and spectrum; and postirradiation annealing are being examined on a wide range of fracture properties. The HSSI Program is arranged into 14 tasks: (1) program management, (2) fracture toughness (K_{Ic}) curve shift in high-copper welds, (3) crack-arrest toughness (K_{Ia}) curve shift in high-copper welds, (4) irradiation effects on cladding, (5) K_{Ic} and K_{Ia} curve shifts in low upper-shelf (LUS) welds, (6) annealing effects in LUS welds, (7) irradiation effects in a commercial LUS weld, (8) microstructural analysis of irradiation effects, (9) in-service aged material evaluations, (10) correlation monitor materials, (11) special technical assistance, (12) Japan Power Development Reactor steel examination, (13) technical assistance for Joint Coordinating Committee on Civilian Nuclear Reactor Safety (JCCCNRS) Working Groups 3 and 12, and (14) additional requirements for materials.

15405 (NUREG/CR–6260) **Application of NUREG/CR-5999 interim fatigue curves to selected nuclear power plant components.** Ware, A.G. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Morton, D.K.; Nitzel, M.E. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Idaho National Engineering Lab., Idaho Falls, ID (United States); Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 190p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-94ID13223. (INEL–95/0045). Source: OSTI; NTIS; INIS; GPO.

Recent test data indicate that the effects of the light water reactor (LWR) environment could significantly reduce the fatigue resistance of materials used in the reactor coolant pressure boundary components of operating nuclear power plants. Argonne National Laboratory has developed interim fatigue curves based on test data simulating LWR conditions, and published them in NUREG/CR-5999. In order to assess the significance of these interim fatigue curves, fatigue evaluations of a sample of the components in the reactor coolant pressure boundary of LWRs were performed. The sample consists of components from facilities designed by each of the four U.S. nuclear steam supply system vendors. For each facility, six locations were studied, including two locations on the reactor pressure vessel. In addition, there are older vintage plants where components of the reactor coolant pressure boundary were designed to codes that did not require an explicit fatigue analysis of the components. In order to assess the fatigue resistance of the older vintage plants, an evaluation was also conducted on selected components of three of these plants. This report discusses the insights gained from the application of the interim fatigue curves to components of seven operating nuclear power plants.

15406 (NUREG/CR–6266) **Analysis of boron dilution in a four-loop PWR.** Sun, J.G. (Argonne National Lab., IL (United States)); Sha, W.T. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Programs; Argonne National Lab., IL (United States). Mar 1995. 69p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (ANL–94/35). Source: OSTI; NTIS; GPO; INIS.

Thermal mixing and boron dilution in a pressurized water reactor were analyzed with COMMIX codes. The reactor system was the four-loop Zion reactor. Two boron dilution scenarios were analyzed. In the first scenario, the plant is in cold shutdown and the reactor coolant system has just been filled after maintenance on the steam generators. To flush the air out of the steam generator tubes, a reactor coolant pump (RCP) is started, with the water in the pump suction line devoid of boron and at the same temperature as the coolant in the system. In the second scenario, the plant is at hot standby and the reactor coolant system has been heated to operating temperature after a long outage. It is assumed that an RCP is started, with the pump suction line filled with cold unborated water, forcing a slug of diluted coolant down the downcomer and subsequently through the reactor core. The subsequent transient thermal mixing and boron dilution that would occur in the reactor system is simulated for these two scenarios. The reactivity insertion rate and the total reactivity are evaluated and a sensitivity study is performed to assess the accuracy of the numerical modeling of the geometry of the reactor coolant system.

15407 (SAND–94-1515/1, pp. 2.3-2.7) **EPRI R&D programs in reactor pressure vessels.** Carter, R. (Electric Power Research Institute, Palo Alto, CA (United States)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was on overview of EPRI's programs on thermal annealing. Goals, key elements, and benefits were discussed.

15408 (SAND–94-1515/1, pp. 2.8-2.11) **EPRI R&D programs in reactor pressure vessels: Workshop overview.** Rosinski, S. (Sandia National Labs., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of the thermal annealing workshop. Keys to a successful annealing program were discussed.

15409 (SAND–94-1515/1, pp. 3.29-3.58) **RPV integrity issues and regulatory requirements.** Gamble, R. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of integrity issues and regulatory requirements. Operational issues were reviewed (LTOP, PTS), as were material issues (upper shelf toughness) and radiation effects. These issues and effects were then linked to present percent regulatory requirements.

15410 (SAND–94-1515/1, pp. 3.3-3.27) **Reactor vessel embrittlement/thermal annealing.** Server, W.L. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a survey of embrittlement causes, actual measurements, and efforts to predict embrittlement. The effects of thermal annealing were also reviewed, as was previous history of the process.

15411 (SAND–94-1515/1, pp. 4.15-4.29) **Economic analysis of reactor vessel thermal annealing.** Griesbach, T.J. Sandia National Labs., Albuquerque, NM (United States). Sep 1994.

(CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of the economics of RPV annealing. Cost factors were reviewed, the results of four case studies using VTESTER were presented. Benefits of annealing were listed.

15412 (SAND–94-1515/1, pp. 4.3-4.13) **Embrittlement management and who is likely to need annealing.** Carter, R.G. (Electric Power Research Institute, Palo Alto, CA (United States)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a review of a program designed to ensure the safe service life of the reactor vessel consistent with regulatory requirements, minimizing embrittlement. Annealings, as a viable option to reactor full service life, was briefly discussed.

15413 (SAND–94-1515/1, pp. 5.3-5.33) **The BR3 vessel anneal: Lessons and perspective.** Fabry, A. (SCK-CEN, Mol (Belgium)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a compilation of transparencies prepared for the RPV thermal annealing workshop. These transparencies described mechanical testing performed on the annealed BR-3 pressure vessel.

15414 (SAND–94-1515/1, pp. 5.35-5.72) **Programme, realization and results from the RPVs annealing of NPP J. Bohunice.** Brumovsky, M. (Nuclear Research Institute, Rez (Czech Republic)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

Pressure vessels of the NPP Jaslovske Bohunice belong to "first generation" quality of WWER-440 reactors of 230 type. They were manufactured from 15Kh2MFA (Cr-Mo-V) type of steel, their welding metals have high content of phosphorus and higher content of copper, but no nickel content. One of the most important requirements for their design was a possibility for transportability by train, thus high neutron fluences are reached in their beltline region. As these materials show high susceptibility to radiation damage, long time ago it was decided to prepare a programme for backfitting realization of their annealing. This programme was prepared in a close cooperation of NPP Bohunice, SKODA Nuclear Machinery and Nuclear Research Institute Rez, all in former Czechoslovakia. Main results from individual parts is presented - annealing of RPVs of both units in NPP J. Bohunice was realized in the beginning of 1993.

15415 (SAND–94-1515/1, pp. 5.73-5.82) **Russian annealing experience and application to U.S. plants.** Cole, N.; Rogov, M.; Morozov, S. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a brief discussion of Russian experiences on the annealing of VVER-440 reactor vessels, with an application of lessons learned to US plants. A plan for annealing of the 1st US plant was presented.

15416 (SAND–94-1515/1, pp. 5.83-5.108) **Investigation of templets cut out of operating reactor vessels before and after annealing.** Kryukov, A. (Kurchatov Institute (Russian Federation)); Platonov, P.; Rogov, M.; Shtrombach, I. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a description of mechanical testing performed on samples of VVER-440 reactor vessels, before and after annealing the test program was presented, as were the results. It was indicated that the before-annealing test results can be used to determine the degree of radiation embrittlement.

15417 (SAND–94-1515/1, pp. 6.3-6.27) **Dry annealing experience in the U.S.** Rishel, R. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a review of dry annealing experience in the US. A number of studies (EPRI, EG&G) were reviewed, and the systems development experiences of Westinghouse were discussed. Drawings and photographs were presented in the workshop. Future efforts were briefly discussed.

15418 (SAND–94-1515/1, pp. 7.3-7.26) **In-place nuclear reactor vessel annealing demonstration project.** Howell, D. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a discussion of the proposed annealing demonstration project at the canceled Marble Hill-1 reactor. The discussion, which was a compilation of transparencies on the noted subject, included overall objectives, scope of work, staging of equipment, and analytical objectives. Current status, including funding was summarized.

15419 (SAND–94-1515/1, pp. 8.13-8.33) **The US Nuclear Regulatory Commission's HSSI program annealing and reembrittlement studies at ORNL.** Iskander, S.K. (Oak Ridge National Lab., TN (United States)); Sokolov, M.A.; Nanstad, R.K.; Corwin, W.R. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. DOE Contract AC05-84OR21400. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of heavy section steel irradiation studies at ORNL. A review of current tasks was presented, as well as a review of both medium and long term studies to examine mechanical properties of irradiated, annealed, and re-irradiated samples results of research were presented.

15420 (SAND–94-1515/1, pp. 8.3-8.4) **ASTM/ASME activities.** Server, W. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a brief discussion of current ASTM/ASME activities on thermal annealing. Ongoing ASME Section XI activities and ASTM E10 task group activities were noted.

15421 (SAND–94-1515/1, pp. 8.35-8.49) **Overview of the UCSB program of fundamental studies on the post irradiation of reactor pressure vessel steels.** Odette, G.R. (Univ. of California, Santa Barbara, CA (United States)); Lucas, G.E.; Mader, E. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of annealing studies at the University of California at Santa Barbara. Objectives and strategy were discussed, as were current results and physical modeling.

15422 (SAND–94-1515/1, pp. 9.121-9.126) **Irradiation-anneal-reirradiation study of reactor pressure vessel materials.** Rosinski, S.T. (Sandia National Labs., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of the status of the DOE sponsored irradiation annealing re-radiation program. A summary of materials tested was presented.

15423 (SAND–94-1515/1, pp. 9.3-9.31) **Actions/issues prior to annealing: Materials considerations.** Mager, T.R. (Westinghouse Electric Corp., Pittsburgh, PA (United States)); Freyer, P.D.; Burke, M.G. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of materials considerations prior to annealing micrographs of 80 welds were presented. Post-annealment response of reirradiated materials were discussed, and post-annealment surveillance recommendations were presented.

15424 (SAND–94-1515/1, pp. 9.33-9.72) **Structural analysis for reactor vessel thermal annealing.** Tunon-Sanjur, L. (Westinghouse Electric Corp., Pittsburgh, PA (United States)). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a discussion of the structural analyses (thermal and stress) required for the annealing process. Results of 2D and 3D studies were presented, with the 3D studies applicable to both a 3-loop and 4-loop plant.

15425 (SAND–94-1515/1, pp. 9.73-9.88) **Mitigation of irradiation embrittlement by annealing.** Kryukov, A. (Kurchatov Institute (Russian Federation)); Platonov, P.; Sokolov, M. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a discussion of Russian philosophy and experiences with thermal annealing. The process described was felt applicable to US materials. Quantitative results were presented graphically.

15426 (SAND–94-1515/1, pp. 9.89-9.119) **1-Dimensional simulation of thermal annealing: Experiments to provide heat transfer boundary conditions and reactor pressure vessel response data to benchmark thermal/stress models.** Nakos, J. (Sandia National Labs., Albuquerque, NM (United States)); Rosinski, S.; Acton, R.; Strait, B.; Schulze, D. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. DOE Contract AC04-76DP00789. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was a review of a proof-of-principle annealing process conducted on a RV section. Test conditions and set-up were described, and photographs of the test setup were presented. Results of various temperature measurements were also presented.

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Refer also to citation(s) 15392, 15540, 17335

15427 (IAEA-TECDOC–784) **Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.** International Atomic Energy Agency, Vienna (Austria). Jan 1995. 125p. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The meeting was convened by the IAEA on the recommendation of the IAEA's International Working Group on Gas Cooled Reactors. It was attended by participants from China, France, Germany, Japan, Netherlands, Switzerland, the Russian Federation, the United Kingdom and the United States of America. The meeting covered the following topics: experimental investigations of the effects of air and water ingress; predicted response of fuel, graphite and other reactor components; options for minimizing or mitigating the effects of air or water ingress. 19 papers were presented at the meeting. A separate abstract was prepared for each of these papers. Refs, figs and tabs.

15428 (IAEA-TECDOC–784, pp. 11-14) **China's HTR test module project.** Zhong Daxin (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Xu Yuanhui; Wu Zongxin. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

In China, the HTGR is being developed for future electricity generation, for process steam and for high temperature process heat. To gain experience in HTGR design, construction and operation a 10 MW Test Module will be constructed at the Institute of Nuclear Energy Technology of Tsinghua University. Start up is foreseen for 1988. (author). 4 figs, 1 tab.

15429 (IAEA-TECDOC–784, pp. 17-24) **Fuel irradiation experiments on HFR-K6 and HFR-B1 with intermittent water vapour injections.** Nabielek, H. (Forschungszentrum Juelich GmbH (Germany)); Conrad, R.; Roellig, K.; Meyers, B.F. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of

fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

Accident sequence are considered for the gas-cooled High-Temperature Reactor (HTR), in which as a consequence of pipe rupture in the steam generator water may enter into the primary circuit and thus the reactor core. In two recent irradiation experiments in the High Flux Reactor Petten, the effect of water vapour injections on the release of fission gases has been investigated. In the test HFR-K6, data on the release from UO_2 are presented for burnups up to 9% FIMA. These results from water vapour injections yield information, heretofore lacking, on the influence under oxidation conditions on fission gas release in pebble bed reactors. In test HFR-B1, water vapour has been injected into fuel elements containing a definite number of UCO particles with exposed kernels dispersed in a fuel compact held in a graphite body. Intermittent water vapour injections were varied between 3 and 1050 Pa. The time profile of fission gas release consists of (i) an initial rapid release; (ii) a subsequent steady release; and (iii) a decline in release following termination of the water vapour injection. These three features correspond to the release of stored fission gas plus diffusional release, to diffusional release only and to the sintering and densification of the fuel in the absence of water vapour. The experiments indicate that the water vapour induced release may contribute significantly to the radiological impact. As a major task for the future evaluation, the relation between the release fraction and the water vapour partial pressure has to be established. (author). 7 refs, 3 figs, 6 tabs.

15430 (IAEA-TECDOC–784, pp. 25-31) **Experimental study on structural integrity of oxidized support post for HTTR.** Ishihara, M. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Iyoku, T.; Shiozawa, S.; Miki, T.; Takikawa, N. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The compressive fracture test of the core support post, which locates below the core of the High Temperature Engineering Test Reactor (HTTR), was carried out using oxidized half-scale post specimens. Test specimens were oxidized in an air environment at three levels of oxidation temperatures. In this paper, the fracture load obtained from the test was found to be much greater than the design seismic load postulated in the HTTR. The fracture load ratio decrease due to oxidation was in a good agreement between the test and the analysis in which the stress concentration fracture was considered at the contact region of the support post and the seat. (author). 7 refs, 9 figs, 1 tab.

15431 (IAEA-TECDOC–784, pp. 32-37) **French gas cooled reactor experience with moisture ingress.** Bastien, D. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Brie, M. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

During the history of operation of six gas cooled reactors in France, some experience has been gained with accidental water ingress into the primary system. This occurred as a result of leaks in steam generators. This paper describes the cause of the leaks, and the resulting consequences. (author). 2 refs, 8 figs.

15432 (IAEA-TECDOC–784, pp. 37-44) **Simulation of steam ingress accidents with irradiated fuel elements.** Schenk, W. (Forschungszentrum Juelich GmbH (Germany)); Nabielek, H. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

Accident sequences are considered for the gas-cooled High Temperature Reactor (HTR), in which water may enter into the primary circuit and reactor core as a consequence of pipe rupture in the steam generator. Irradiation experiments with intermittent water injections have demonstrated that moisture in the sweep gas lead to an increase of the release of fission gases and iodine from defective/failed particles. A special apparatus KORA was constructed in the Hot Cells of the Research Centre Juelich to study the effects of moisture-related fission product release as a function of temperature and water vapour partial pressure with different fuel samples. Initial experiments with irradiated UO_2 and UCO fuels at 800 deg. C showed an increased of ^{85}Kr release with water vapour additions. In contrast, intact particles are not affected even by extremely long water vapour injections. UO_2 kernels obtained by cracking particles from spherical fuel elements correspond to irradiation-induced failures; they show the following release fractions at 800 deg. C after repeated injections of water vapour: with a medium burn-up of 5% FIMA; with a high burn-up of 9% FIMA; release of 0.4 to 2.6% of the ^{85}Kr inventory; release of 17% of the ^{85}Kr inventory. In the case of defective UO_2 TRISO particles, which would dominate the release in an HTR-MODUL, some of the free fuel may have been carburized in the fabrication process during the final heat treatment at 1950 deg. C, which could lead to changed release behaviour. Further studies will have to show whether the release as a consequence of the influence of water vapour is similar to that from UO_2 kernels or possible higher. There was a complete moisture-induced release from high-burnup UCO kernels or designed-to-fail particles with a burnup of 20% FIMA. (Abstract Truncated)

15433 (IAEA-TECDOC–784, pp. 44-50) **Experimental investigations of reactivity effects caused by water ingress in a LEU-LHTR pebble-bed core.** Seiler, R. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Chawla, R.; Hager, H.; Mathews, D.; Williams, T. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

A series of new critical experiments, in the framework of an IAEA Coordinated Research Programme on "Validation of Safety Related Reactor Physics Calculations for Low Enriched HTRs", is being carried out at the zero power facility, PROTEUS. The main aim of the experiments is the generation of safety related physics data to reduce the design and licensing uncertainties for small- and medium-sized, highly reflected, helium cooled reactors. The main parameters being investigated in the programme are critical masses, streaming effects, and changes in reactivity, neutron balance components and control rod effectiveness caused by water ingress into the reactor. Different deterministic pebble loading arrangements are being investigated in PROTEUS. This allows access to the core centre and the insertion of polyethylene rods for the simulation of water ingress. LEU fuel elements (German AVR type) of 16.7% ^{235}U enrichment and graphite elements, are being used to cover a range of moderator-to-fuel ratios. A first water ingress experiment was carried out with small amounts of plastic in HTR-PROTEUS Core 1 (an under-moderated close-packed hexagonal lattice with a carbon-to-uranium atom ratio of about 960). The reactivity increase in this case was small enough to be compensated by movement of the control rods. Good agreement was

obtained between measured and calculated values. Investigations in progress include a case with a much larger amount of plastic in this same type of core with criticality maintained by reduction of the core height. Experiments with plastic contents up to the amount corresponding to a maximal reactivity increase are planned in subsequent HTR-PROTEUS cores (a different core lattice arrangement is required to allow the introduction of the required amount of plastic in the form of rods). 19 refs, 4 figs, 2 tabs.

15434 (IAEA-TECDOC–784, pp. 50-54) **Experimental results of air ingress in heated graphite channels: A summary of American analyses of the Windscale and Chernobyl accidents.** Schweitzer, D.G. (Brookhaven National Lab., Upton, NY (United States)). International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

A program was initiated at BNL, in which a series of extensive full scale air ingress experiments were performed in 10 ft. long graphite channels in the temperature range from 300 deg. C - 800 deg. C. The experiments addressed the generic question of under what conditions "graphite burning" would or would not occur. Several hundred measurements were made, in which temperature-time-gas composition changes along the 10 ft channels were studied as functions of the air flow rates, air composition, channel geometry, graphite reactivity, Wigner energy etc. The conditions under which CO-O_2 explosions occurred were determined experimentally. In some cases the temperature-gas composition changes with position in the graphite channels were followed for several days before individual experiments were concluded. After concluding the "graphite burning" studies, BNL initiated an experimental program on the consequences of high temperature fuel failure in HTGRs for the Nuclear Regulatory Commission. Following the Chernobyl accident, the Nuclear Regulatory Commission requested that the members of the BNL staff who were involved in the Windscale accident analyses and the HTGR accident evaluation program re-evaluated the safety of all reactors in the USA that contained graphite. A safety evaluation was initiated and complete which addressed, in detail, the generic (design independent) conditions under which air ingress and Wigner energy releases could lead to self-sustained graphite fires in nuclear reactors. The two programs, produced comprehensive experimental and analytical investigations of the conditions under which air ingress and Wigner releases could lead to "graphite burning" in nuclear reactors. 13 refs.

15435 (IAEA-TECDOC–784, pp. 55-61) **The NACOK experiment on natural convection of air through the core.** Froehling, W. (Forschungszentrum Juelich GmbH (Germany)); Hohn, H.; Kugeler, M.; Sun, Y.; Zhang, Z. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

KFA is setting up an experiment to study the ingress of air into the core, with the subsequent formation of an airflow driven by natural convection, for the hypothetical accident of a complete rupture of the coaxial hot gas duct. The experiment will have an active height for the natural convection of 7,50 m and a maximum temperature of 1,200 deg. C. The aim aims are to determine the onset time of the convection depending on various parameters, the mass flow and the locally dependent corrosion phenomena caused by the draft. By this means the theoretical models can be validated. The layout of the experiment as well as theoretical investigations to predict the expected performance are reported. (author). 3 refs, 15 figs.

15436 (IAEA-TECDOC–784, pp. 61-66) **Investigation of air ingress accidents under depressurization of the VGM modular reactor primary circuit.** Kuzavkov, N.G. (OKBM, Nizhny Novgorod (Russian Federation)); Tonny, S.I.; Shepelev, S.F.; Klyukin, S.M.; Zyryanov, S.I. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

VGM modular gas cooled reactors have been developed in Russia for production of electricity and high temperature process heat. Experimental facilities have been constructed and operated to substantiate the safe behaviour of the VGM reactor to accidental air or water ingress. Also, computer programmes have been developed to predict reactor response to these conditions. (author). 5 figs 2 tabs.

15437 (IAEA-TECDOC–784, pp. 69-72) **Transient analysis of air ingress from broken pipe into the HTR-10 reactor pressure vessel.** Gao Zuying (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Li Baoyan; Wang Chunyun; Jiang Zhiqiang. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The high temperature gas-cooled test reactor HTR-10 is a modular pebble bed core reactor. The spherical fuel elements are loaded and discharged continuously from the top to the bottom of the reactor pressure vessel(RPV) in operation. The rupture of a fuel handling tube is classified as one of the design basis accidents of HTR-10 reactor. After the accident of the rupture of a fuel handling tube, the RPV depressurizes speedily to the atmosphere in 3 minutes. Following the cooled helium of the reactor, air enters into the RPV and a natural convection will be built up. A numerical simulation of graphite oxidation is carried out by the OXIDE-RE code to analyze the consequences of the accident. The graphite oxidate reaction produces carbon monoxide and carbon dioxide. The concentration distributions of carbon monoxide and carbon dioxide and the graphite structure in the reactor are analyzed. Because of the relative lower temperature in the core throughout this accident, the amount of dioxide and oxygen production can meet the safety requirements. It is impossible to initiate denotation in HTR-10 reactor. (author). 5 refs, 13 figs, 1 tab.

15438 (IAEA-TECDOC–784, pp. 72-78) **Evaluating on graphite oxidation during an air ingress accident in HTTR.** Iyoku, T. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Maruyama, S.; Ishihara, M.; Shiozawa, S.; Ohashi, K.; Okamoto, F.; Hayakawa, H. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The High Temperature Engineering Test Reactor (HTTR) is a graphite-moderated and helium gas-cooled reactor with prismatic fuel elements of hexagonal blocks. Each fuel element consists of graphite sleeves containing fuel compacts and a graphite block holding graphite sleeves. A support post is a cylindrical component and the most essential element to support the core. There are two kinds of accidents classified as an air ingress accident in the safety design of the HTTR; one is the rupture of the primary concentric

hot gas duct at the reactor pressure vessel (RPV) inlet nozzle, the other the rupture of a stand pipe attached to the top head closure of the RPV. The graphite structures will be oxidized during the air ingress accidents. It was found from this study that the air ingress accident of the guillotine rupture of the primary concentric hot gas duct was the severest from the graphite oxidation point of view and the oxidized graphite structures maintained the structural integrity after the accident. There is also no possibility of detonation induced by the produced carbon monoxide in the containment vessel. (author). 9 refs, 12 figs, 1 tab.

15439 (IAEA-TECDOC–784, pp. 79-85) **Scenarios of hypothetical water and air ingress in small modular HTGRs.** Scherer, W. (Forschungszentrum Juelich GmbH (Germany)); Gerwin, H. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The ingress of larger amounts of water, steam or air into the primary circuit of a high temperature reactor is seen to be an accident of considerable safety relevance. The overall destructive potential of these effects depends strongly on the quantities of the invading material as well as on the physical and operational boundary conditions of the reactor system at the time of the ingress. The safety analysis of water and air ingress accidents therefore is based on scenarios depending on the plant's conditions and considering different levels of protection systems failures. With respect to a catastrophe-free nuclear technology scenarios in the hypothetical area without any protection system action are of special interest. Starting from the knowledge on design basis accident behaviour of the German modular HTR this paper discusses some scenarios in the hypothetic accident field that should be analyzed in detail to find the limitations of the inherent safety features of this type of reactor. For some cases preliminary answers on the basis of less sophisticated computer models are given and suggestions for further developments and improvements of the reactor design are formulated. (author). 13 refs, 12 figs.

15440 (IAEA-TECDOC–784, pp. 86-91) **Thermodynamic analysis of behaviour of HTGR fuel and fission products under accidental air or water ingress conditions.** Minato, K. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Fukuda, K. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

A core of high temperature gas-cooled reactor (HTGR) consists of coated fuel particles, graphite and absorber of boron carbide (B_4C). Silicon carbide (SiC) as well as pyrolytic carbon (PyC) are used as coating materials for TRISO-coated fuel particles. Zirconium carbide (ZrC) is a candidate coating material which is expected to be used at higher temperatures than SiC. Thermodynamic analysis was carried out to understand the chemical behaviour of these materials and fission products under accidental air or water ingress conditions. The analysis on the systems of SiC-C-(O_2 or H_2O)-He, ZrC-C-(O_2 or H_2O)-He, and B_4C-C-(O_2 or H_2O)-He showed that the active-to-passive transitions of oxidation of SiC+C, ZrC+C and B_4C+C occurred at lower temperatures than those of SiC, ZrC and B_4C, respectively, at a given initial O_2 or H_2O pressure. Under most of the accident conditions the passive oxidation of these materials was expected to occur. In the passive oxidation of SiC+C, ZrC+C and B_4C+C preferential oxidation of SiC, ZrC and B_4C occurred, respectively, while C was not oxidized as long as SiC, ZrC and B_4C were present. B_4C was oxidized to B_2O_3 under the conditions of interest, where B_2O_3 was liquid with high vapor pressure of B-containing species. The analysis on the system of Cs-I-B_4C-C-(O_2 or H_2O)-He showed that cesium would form $CsBO_2$ if boron was available. Melting point of $CsBO_2$ is 989.7 K, which is higher than those of Cs and CsOH. This suggests that cesium should be deposited as $CsBO_2$ at higher temperature regions than as Cs or CsOH, which results in decrease in cesium release to the environment. (author). 25 refs, 8 figs.

15441 (IAEA-TECDOC–784, pp. 92-96) **Transient analysis of water ingress into the HTR-10 high temperature gas cooled test reactor.** Gao Zuying (Qinghua Univ., Beijing, BJ.(China). Inst. of Nuclear Energy Technology); Wang Chunyun. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The high temperature gas-cooled test reactor HTR-10 is a graphite moderated and helium cooled reactor with a pebble bed core of spherical fuel elements. The primary system consists of reactor pressure vessel, steam generator vessel and hot gas duct vessel. The water ingress into HTR-10 reactor pressure vessel can occur for the accident of the rupture of the heat transfer tube of the steam generator. The mixture of helium and steam will enter the reactor with the stream. The transient behaviour of reactivity increase and graphite corrosion of both fuel elements and graphite structure caused by chemical reaction between graphite and steam are analyzed in order to evaluate the safety feature. The water ingress rate, reactivity increase, pressure and temperature transients in the primary system and graphite oxidation are analyzed by making use of the RETRAN code, THERMIX code and OXID-RE code. With the analytical results that the fuel element and graphite structure corrosion is not significant, the overpressurization of the reactor vessel is only for hypothetical accident. (author). 6 refs, 16, figs, 3 tabs.

15442 (IAEA-TECDOC–784, pp. 97-103) **Evaluation of graphite oxidation during water ingress accidents in HTTR.** Maruyama, S. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan)); Saikusa, A.; Ikoku, T.; Kunitomi, K.; Shiozawa, S.; Ohashi, K.; Hayakawa, H. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The High Temperature Engineering Test Reactor (HTTR) is a graphite-moderated and helium gas-cooled reactor with prismatic fuel elements of hexagonal blocks. The graphite oxidation is one of the major concerns in the water ingress accident with respect to the structural integrity of the core. The water ingress accident is initiated by the rupture of a heat transfer tube in the primary pressurized water cooler. After the steam enters the core, it reacts with graphite structures. In order to evaluate the structural integrity of the graphite structures in the HTTR, the graphite oxidation analysis was made using the OXIDE-3F code. In the present study, it was confirmed that the graphite structures were not oxidized significantly because of rapid temperature decrease due to forced cooling by the auxiliary cooling system. It was also clarified that the water ingressed into the primary cooling system (PCS) did not lead significant pressure increment which could cause safety valve opening and consequent fission products release outside the PCS. (author). 6 refs, 14 figs, 1 tab.

15443 (IAEA-TECDOC–784, pp. 107-109) **Study of reaction: Coated SiC coating on HTGR fuel elements.** Tang Chunhe (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Guan Jie; Li Ende; Zhang Chun. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements

and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The graphite has excellent nuclear and high temperature performance, and is used in atomic reactors with enormous quantities. The oxidation resistance of graphite is very poor, therefore, the application of graphite is only in restricted environment. SiC presents excellent ability of the oxidation resistance. It is reported in this paper that the uniform and dense SiC coating is formed by the reaction of the graphite matrix and melted silicon. Oxidation experiments show that, when samples were heated to 1000 deg. C in air for h hours, the graphite was burnt off 68 wt. %, whereas the coated graphite only 1.7 wt.%, and 1.0wt% at. 1500 deg. C in air for 2 hours. (author). 5 refs, 7 figs, 2 tabs.

15444 (IAEA-TECDOC–784, pp. 110-115) **The roles of water addition and gas composition in AGR accident management.** Dawson, J.T. (Nuclear Electric plc, Berkeley (United Kingdom)); Smith, P.N. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

Severe Accident Guidelines (SAGs) are being produced in line with best international practice for managing a severe accident in an AGR. Such an accident would be extremely unlikely due to the long timescales for recovery prior to core damage. A number of actions proposed in the SAGs are concerned with the prevention of air ingress and the deliberate injection of water into the core. Air ingress is minimized by sealing breaches and by the controlled injection of inert gases into the vessel, although at high temperatures the change in reactor gas from CO_2 to CO provides a more inert atmosphere and reduces any ingressing oxygen. Consideration would be given to the injection of water into the core if the installed cooling systems could not be recovered sufficiently in a direct or improvised manner. In such cases sufficient cooling should be possible by injecting water uniformly across the core into a few tens of channels. Ideally the water would be injected before significant fission product release had occurred and before the graphite had become hot enough to oxidise in steam. This advice is reinforced by experiments with a simulated fuel pin in the presence of reactor graphite which showed that fission products released from the pin could be transported on fine (0.1 μm) graphite aerosols. (author). 4 refs, 6 figs.

15445 (IAEA-TECDOC–784, pp. 116-120) **Study of the method to improve the corrosion resistance of the matrix materials of spherical fuel elements in HTGR.** Zhang Shichao (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); Qiu Xueliang; Ma Changwen. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

Ceramic fuel element is one of the most important items of HTGR technology, and the corrosion resistance of is matrix materials is vital to the operational performance of HTGR. In the paper, based on the oxidation study of the matrix materials, it has been proposed that the corrosion resistance of the matrix materials might be improved through forming carbon -ceramic composite. The experiment results have shown that the corrosion resistance of matrix materials has been improved by addition of SiC superfine powders, and that the matrix materials containing SiC superfine powders and heat-treated at 1600 deg. C had an oxidation rate lower than the general one containing no SiC superfine powder and heat-treated at 1950 deg. C. (author). 5 refs, 8 figs.

15446 (IAEA-TECDOC–784, pp. 120-124) **Ceramic coatings for HTR graphitic structures.** Hurtado, A.M. (Aachen Univ., Aachen (Germany). Inst. of Reactor Safety and Technology); Schroeder, B.; Gottaut, H. International Atomic Energy Agency, Vienna (Austria). Jan 1995. (CONF-9310429–: Technical committee meeting on response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions, Beijing (China), 25-27 Oct 1993). In *Response of fuel, fuel elements and gas cooled reactor cores under accidental air or water ingress conditions. Proceedings of a technical committee meeting held in Beijing, China, 25-27 October 1993.* 125p. Order Number DE95628012. Source: OSTI; NTIS (US Sales Only); INIS.

The main intention of ceramic coatings is to realize a corrosion resistance for graphitic structures in the temperature range of 450 to 1600 deg. C. To obtain a wide basis for producing these coated structures different graphite qualities were tested. For the production of ceramic coatings on silicon carbide basis different methods were applied. Industrial coatings were successfully produced with the slip casting method. Using chemical vapour deposition methods ceramic coatings were produced with excellent corrosion resistance. At the Technical University in Aachen and the Research Center in Juelich a special coating method being a combination of silicon infiltration and slip casting method was successfully developed for this kind of application. To characterize the produced coatings a lot of corrosion tests were carried out simulating hypothetical accident conditions in high temperature reactors (massive water and air ingress into the core) in the temperature range of 500 to 1500 deg. C. The gravimetrically measured reaction rates in air by equivalent air velocities amount to $R \leq 1$ mg/cm^{2}h. For simulated water ingress accidents the maximal reaction rates (T=800 deg. C) are 0,2mg/cm^{2}h. these results show, that a ceramic coating leads to very high corrosion resistance for graphitic core materials. (author). 6 refs, 5 figs, 2 tabs.

15447 (INIS-JP–039) **Present status of high temperature engineering test and research, 1994.** Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment. Oct 1994. 104p. (In Japanese). Order Number DE95768257. Source: OSTI; NTIS; INIS.

High temperature gas-cooled reactors have excellent features such as the generation of high temperature close to 1000degC, very high inherent safety and high fuel burnup. By the advanced basic research under high temperature irradiation condition, the creation of various new technologies which become the momentum of future technical innovation can be expected. The construction of the high temperature engineering test reactor (HTTR) was decided in 1987, which aims at the thermal output of 30 MW and the coolant temperature at reactor exit of 950degC. The initial criticality is scheduled in 1998. Japan Atomic Energy Research Institute has advanced the high temperature engineering test and research, and plans the safety verifying test of the HTTR, the test of connecting heat utilization plants and so on. In this report, mainly the results obtained for one year from May, 1993 are summarized. The outline of the high temperature engineering test and development of the HTTR technologies are reported. (K.I.).

15448 (LTKK-TJ–41, pp. 41-50) **Structural safety analysis of Ignalina NPP.** Petkevicius, K. (Lithuanian Energy Inst., Kaunas (Liechtenstein)); Gundulis, G.; Marchertas, A. Lappeenranta Univ. of Technology (Finland). 1994. (CONF-9406330–: Seminar on French-Finnish colloquium on safety of French and Russian type nuclear power plants, Lappeenranta (Finland), 14-16 Jun 1994). In *French-Finnish colloquium on safety of French and Russian type nuclear power plants.* 286p. Order Number DE95628752. Source: OSTI; NTIS; INIS.

A mathematical model of the structural confinement system or the Accident Confinement System (ACS) of the RBMK-1500 reactors is presented. The system is required to prevent the release of radioactive products from reaching the environment in case of an accident in the reactor's cooling system. The mathematical model of the structure is subjected to the specified design pressures. The results are analysed with respect to wall deflections and maximum stresses in the reinforcing bars which maintain the integrity of the

ACS walls. They indicate excessive deflections of the walls and stresses in reinforcement in certain areas of the ACS. (orig.) (4 refs., 10 figs.).

2104 Power Reactors, Nonbreeding, Otherwise Moderated Or Unmoderated

Refer also to citation(s) 15459, 15495

15449 (BARC–1994/E/031) **Generation of data base for on-line fatigue life monitoring of Indian nuclear power plant components: Part I - Generation of Green's functions for end fitting.** Mukhopadhyay, N.K. (Bhabha Atomic Research Centre, Bombay (India). Reactor Engineering Division); Dutta, B.K.; Kushwaha, H.S. Bhabha Atomic Research Centre, Bombay (India). 1994. 28p. Order Number DE95628021. Source: OSTI; NTIS (US Sales Only); INIS.

Green's function technique is the heart of the on- line fatigue monitoring methodology. The plant transients are converted to stress and temperature response using this technique. To implement this methodology in a nuclear power plant, Green's functions are to be generated in advance. For structures of complex geometries, Green's functions are to be stored in a data base to convert on-line, the plant data to temperature/stress response, using a personal computer. End fitting, end shield, pressurizer, steam generator tube sheet are few such components of PHWR where fatigue monitoring is needed. In the present paper, Green's functions are generated for end fitting of a 235 MWe Indian PHWR using finite element method. End fitting has been analysed using both 3-D and 2-D (axisymmetric) finite element models. Temperature and stress Green's functions are generated at few critical locations using the code ABAQUS. (author). 10 refs., 11 figs.

15450 (BARC–1994/E/032) **Elasto-plastic finite element analysis of axial surface crack in PHT piping of 500 MWe PHWR.** Chawla, D.S. (Bhabha Atomic Research Centre, Bombay (India). Reactor Engineering Div.); Bhate, S.R.; Kushwaha, H.S.; Mahajan, S.C. Bhabha Atomic Research Centre, Bombay (India). 1994. 60p. Order Number DE95628022. Source: OSTI; NTIS (US Sales Only); INIS.

The leak before break (LBB) approach in nuclear piping design envisages demonstrating that the pressurized pipe with a postulated flaw will leak at a detectable rate leading to corrective action well before catastrophic rupture would occur. This requires analysis of cracked pipe to study the crack growth and its stability. This report presents the behaviour of a surface crack in the wall of a thick primary heat transport (PHT) pipe of 500 MWe Indian PHWR. The line spring model (LSM) finite element is used to model the flawed pipe geometry. The variation of crack driving force (J-integral) across the crack front has been presented. The influence of crack geometry factors such as depth, shape, aspect ratio, and loading on peak values of J-integral as well as crack mouth opening displacement has been studied. Several crack shapes have been used to study the shape influence. The results are presented in dimensionless form so as to widen their applicability. The accuracy of the results is validated by comparison with results available in open literature. (author). 47 refs., 8 figs.

15451 (BARC–1994/E/037) **"HFLOWR" - a computer code for predicting flow regimes in a horizontal channel with rod cluster.** Lele, H.G. (Bhabha Atomic Research Centre, Bombay (India). Reactor Safety Div.); Gupta, S.K.; Venkat Raj, V. Bhabha Atomic Research Centre, Bombay (India). 1994. 57p. Order Number DE95628023. Source: OSTI; NTIS (US Sales Only); INIS.

Indian Pressurised Heavy Water Reactors have horizontal channels containing rod clusters. Occurrence of flow stratification under postulated accident conditions , significantly affects the temperatures of the exposed fuel rods. The various thermodynamic models that are to be used for the analysis depend on the flow regimes, which are expected to occur in the channel. A computer program HFLOWR has been developed to obtain the dimensionless flow regime maps and flow patterns in reactor channels of Indian PHWR under various coolant conditions. This code can be integrated with the safety analysis code, for flow regime prediction under transient/accident conditions. This report describes the various mathematical formulations used in the code and the various analyses done using this code. (author). 6 refs., 1 appendix, 34 figs.

2105 Power Reactors, Breeding

Refer also to citation(s) 15481, 15602, 16930

15452 (ANL/IFR/CP–83257) **System modeling of spent fuel transfers at EBR-II.** Imel, G.R. (Argonne National Lab., Idaho Falls, ID (United States)); Houshyar, A. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–32: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009910. Source: OSTI; NTIS; INIS; GPO Dep.

The unloading of spent fuel from the Experimental Breeder Reactor-II (EBR-II) for interim storage and subsequent processing in the Fuel Cycle Facility (FCF) is a multi-stage process, involving complex operations at a minimum of four different facilities at the Argonne National Laboratory-West (ANL-W) site. Each stage typically has complicated handling and/or cooling equipment that must be periodically maintained, leading to both planned and unplanned downtime. A program was initiated in October, 1993 to replace the 330 depleted uranium blanket subassemblies (S/As) with stainless steel reflectors. Routine operation of the reactor for fuels performance and materials testing occurred simultaneously in FY 1994 with the blanket unloading. In the summer of 1994, Congress dictated the October 1, 1994 shutdown of EBR-2. Consequently, all blanket S/As and fueled drivers will be removed from the reactor tank and replaced with stainless steel assemblies (which are needed to maintain a precise configuration within the grid so that the under sodium fuel handling equipment can function). A system modeling effort was conducted to determine the means to achieve the objective for the blanket and fuel unloading program, which under the current plan requires complete unloading of the primary tank of all fueled assemblies in 2 1/2 years. A simulation model of the fuel handling system at ANL-W was developed and used to analyze different unloading scenarios; the model has provided valuable information about required resources and modifications to equipment and procedures. This paper reports the results of this modeling effort.

15453 (DOE/RL–94-137) **Radioactive air emissions notice of construction Sodium Storage Facility.** Homan, N.A. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009139. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Sodium Storage Facility (SSF) is to receive molten sodium coolant from the Fast Flux Test Facility (FFTF), store the sodium in a solid state for an extended period, and then melt the sodium for transfer to a future Sodium Reaction Facility. SSF is required for sodium offload during FFTF transition to a safe, stable condition for long-term surveillance and maintenance pending final decommissioning. About 984,100 liters of sodium will be offloaded from FFTF to tank storage in SSF during this transition period. Unused carbon steel sodium tanks originally built for the Clinch River Breeder Reactor plant will be used. Once the storage tanks are in place, a concrete building will be constructed around and over them to provide shielding and weather protection. This document serves as a notice of construction pursuant to the requirements of Washington Administrative Code WAC 246-247-060 and as a request for approval to construct pursuant to 40 Code of Federal Regulations CFR 61.96 for SSF. Information is arranged to closely reflect the order of the requirements in WAC 246-247-110.

2107 Regulation and Licensing

Refer also to citation(s) 15405

15454 (BNL-NUREG–61565) **Piping benchmark problems for advanced reactor standardized designs.** Bezler, P. (Brookhaven National Lab., Upton, NY (United States)); DeGrassi, G.; Braverman, J.; Terao, D.; Hou, Shou-Nien. Brookhaven National Lab., Upton, NY (United States). [1995]. 14p. Sponsored by

Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–23: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Source: OSTI; NTIS; INIS.

In accordance with the standard design certification process established under the rules of 10 CFR, Part 52, the NRC staff will use design acceptance criteria (DAC) verified by inspections, tests, analyses and acceptance criteria (ITAAC) to make safety determinations for technical areas of advanced standardized nuclear plant designs for which final design information is not available. Piping and pipe support design has been identified as one such technical area. One element of the DAC for piping requires the applicant for a combined license to verify the sufficiency of the computer codes and modeling techniques to be used to complete its piping stress analyses. To provide the basis for this verification the staff sponsored the development of piping benchmark problems for the General Electric Advanced Boiling Water Reactor (ABWR), the ABB/Combustion Engineering System 80+ and the Westinghouse AP600 standardized reactor designs. These analytical problems involve the modeling of representative piping systems subjected to plant specific dynamic loads with solutions developed using the proposed for analysis for each standardized design. A summary description of each problem and the acceptance criteria to be met are included.

15455 (IAEA-ITEREDA/DS–04) **ITER council proceedings: 1993.** ITER EDA Documentation Series, no.4. International Atomic Energy Agency, Vienna (Austria). 1994. 111p. Order Number DE95628141. Source: OSTI; NTIS (US Sales Only); INIS.

Records of the third ITER Council Meeting (IC-3), held on 21-22 April 1993, in Tokyo, Japan, and the fourth ITER Council Meeting (IC-4) held on 29 September - 1 October 1993 in San Diego, USA, are presented, giving essential information on the evolution of the ITER Engineering Design Activities (EDA), such as the text of the draft of Protocol 2 further elaborated in "ITER EDA Agreement and Protocol 2" (ITER EDA Documentation Series No. 5), recommendations on future work programmes: a description of technology R and D tastes; the establishment of a trust fund for the ITER EDA activities; arrangements for Visiting Home Team Personnel; the general framework for the involvement of other countries in the ITER EDA; conditions for the involvement of Canada in the Euratom Contribution to the ITER EDA; and other attachments as parts of the Records of Decision of the aforementioned ITER Council Meetings.

15456 (NUREG–0540-Vol.17-No.2) **Title list of documents made publicly available: February 1–28, 1995. Volume 17, Number 2.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. Apr 1995. 335p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This monthly publication contains descriptions of the information received and generated by the US Nuclear Regulatory Commission (NRC). This information includes (1) docketed material associated with civilian nuclear power plants and other uses of radioactive materials and (2) nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. As used here, docketed refers to the system by which NRC maintains its regulatory records. This series of documents is indexed by a Personal Author Index, a Corporate Source Index, and a Report Number Index. NRC documents that are publicly available may be examined without charge at the NRC Public Document Room (PDR).

15457 (NUREG–1525) **Assessment of the NRC Enforcement Program.** Lieberman, J.; Coblentz, L. Nuclear Regulatory Commission, Washington, DC (United States). Apr 1995. 196p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

On May 12, 1994, the Executive Director for Operations (EDO) established a Review Team composed of senior NRC managers to re-examine the NRC enforcement program. A copy of the Review Team's charter is enclosed as Appendix A. This report presents the Team's assessment. The purpose of this review effort are: (1) to perform an assessment of the NRC's enforcement program to determine whether the defined purposes of the enforcement program are appropriate; (2) to determine whether the NRC's enforcement practices and procedures for issuing enforcement actions are consistent with those purposes; and (3) to provide recommendations on any changes the Review Team believes advisable. In accordance with its charter, the Review Team considered the following principal issues in conducting its assessment of the enforcement program: the balance between providing deterrence and incentives (both positive and negative) for the identification and correction of violations; the appropriateness of NRC sanctions; whether the commission should seek statutory authority to increase the amount of civil penalties; whether the NRC should use different enforcement policies and practices for different licensees (e.g., materials licensees in contrast to power reactors or large fuel facilities); and whether the commission should establish open enforcement conferences as the normal practice.

15458 (SAND–94-1515/1, pp. 8.5-8.11) **Status of rule and regulatory guide development.** Hiser, A. Jr. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. (CONF-9402110–Vol.1: DOE/SNL/EPRI workshop on reactor pressure vessel thermal annealing, Albuquerque, NM (United States), 17-18 Feb 1994). In *Proceedings of the DOE/SNL/EPRI sponsored Reactor Pressure Vessel Thermal Annealing Workshop. Volume 1.* 513p. Order Number DE95002786. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this paper was an overview of rulemaking on RPV integrity and thermal annealing. NRC research efforts on annealing were discussed also.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory and Calculation

Refer also to citation(s) 15382, 15406, 16288, 17335

15459 (BARC–1994/E/039) **An improved scheme for the evaluation of λ-modes of a multi-group neutron diffusion equation.** Modak, R.S. (Bhabha Atomic Research Centre, Bombay (India). Theoretical Physics Div.); Jain, V.K.; Gupta, H.P. Bhabha Atomic Research Centre, Bombay (India). 1994. 26p. Order Number DE95627961. Source: OSTI; NTIS (US Sales Only); INIS.

The λ-modes of a nuclear reactor, which are the higher eigenfunctions of the multiplication eigenvalue problem in multi-group neutron diffusion theory, are required in several reactor applications. The evaluation of these modes is a task involving a significant computational effort. Here, a scheme is presented to find these modes, which is versatile, easy to implement and suitable for parallel processing. In this scheme, the fission source method, earlier developed by us, has been substantially improved by incorporating the novel technique of sub-space iteration for non-symmetric eigenvalue problems. The scheme is validated against the well-known Subtraction Method by finding the modes of a test-case, which represents a typical large-sized Pressurised Heavy Water Reactor. (author). 8 refs., 1 fig., 7 tabs.

15460 (IAE–2158/2) **Application of WIMSD-4 for "MARIA" reactor lattice calculations.** Andrzejewski, K. (Institute of Atomic Energy, Otwock-Swierk (Poland)); Kulikowska, T. Institute of Atomic Energy, Otwock-Swierk (Poland). Dec 1993. 44p. Order Number DE95628733. Source: OSTI; NTIS; INIS.

A general description of the WIMSD-4 lattice code is given with the emphasis on available geometrical models. The difficulties encountered while modelling reactor lattices with the tubular type fuel elements are explained. Then the analysis of code options allowing to overcome these difficulties is carried out. Eventually, recommendations of options and input parameters for calculations of MARIA reactor lattice with satisfactory accuracy are given. During the work a set of modifications had to be introduced leading to a new code version called WIMS-S. Another version, under the name WIMS-T has been developed to allow for burnup calculations of the MARIA reactor lattice with improved resonance approach. (author). 14 refs, 6 figs, 10 tabs.

15461 (JINR-E-3-94-128, pp. 5-6) **Computer simulations of homogeneous water solution pulse reactor.** Hetrick, D.L.; Kimpland, R.H.; Kornreich, D.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIQUID HOMOGENEOUS REACTORS/ computerized simulation; LIQUID HOMOGENEOUS REACTORS/ reactor kinetics; DISSOLVED GASES; PULSED REACTORS

2202 Components and Accessories

Refer also to citation(s) 15404, 15406, 15570, 15583, 15603, 15605, 15606, 15607, 15901, 16130

15462 (BARC–1994/E/035) **Experimental and analytical studies of leak-before-break on circumferentially through-wall cracked pipes under bending load : Part-1 (September 1993 - June 1994).** Mahanty, D.K. (Bhabha Atomic Research Centre, Bombay (India). Reactor Design and Development Group); Kushwaha, H.S.; Mahajan, S.C.; Kakodkar, A. Bhabha Atomic Research Centre, Bombay (India). 1994. 91p. Order Number DE95627965. Source: OSTI; NTIS (US Sales Only); INIS.

Fracture control of structures is the concerted efforts by designers, metallurgists, production and maintenance engineers and inspectors to ensure safe operation without catastrophic fracture failures. If fracture is to be prevented, the strength should not drop below a certain safe value which means that cracks must be prevented to reach a critical size. Since piping is very important component in nuclear power plants, fracture control plans have been employed increasingly to ensure for better plant availability. Leak-before break (LBB) is now widely applied in nuclear industries as a means of assessing the susceptibility of a pressurised components to failure by unstable crack growth. In this report experimental and analytical studies are conducted on circumferential through wall cracked pipe subjected to pure bending load. Pipes made of three different types of steels are tested with crack size varying from 15% to 50% of circumference. Experimental results pertaining to fracture load, crack mouth opening displacement (CMOD), load point rotation and J-integral are presented. Prediction of maximum moment and stress based on net-section collapse (NSC) method and modified NSC method are also presented and compared with experimental data. Comparison between experimental and analytical results were found to be good. These all studies throw some more light on the understanding of the pipe fracture and relative accuracy and margin of conservatism of the methods when applied to full scale set up. (author). 32 refs., 45 figs., 12 tabs., 2 appendixes.

15463 (BNL-NUREG–61558) **Flexible piping design: A case study.** Bezler, P.; DeGrassi, G. Brookhaven National Lab., Upton, NY (United States). [1995]. 10p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–24: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Source: OSTI; NTIS; INIS.

Flexible piping in an objective of current piping design. Such piping design can lead to some unexpected and unusual characteristics. These characteristics are demonstrated through a case study of a pressurizer surge line designed to have a low fundamental frequency and essentially no intermediate seismic constraints in the vertical direction. Results for envelope response spectra, multiple response spectra and time history methods of analysis are compared. The envelope response spectra method is shown to provide non-conservative estimates of system response for some conditions.

15464 (CONF-950740–16) **Validation of favor code linear elastic fracture solutions for finite-length flaw geometries.** Dickson, T.L.; Keeney, J.A.; Bryson, J.W. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. Agreement Number 1886-8084-5B. From Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995. Order Number DE95009034. Source: OSTI; NTIS; INIS; GPO Dep.

One of the current tasks within the US Nuclear Regulatory Commission (NRC)-funded Heavy Section Steel Technology Program (HSST) at Oak Ridge National Laboratory (ORNL) is the continuing development of the FAVOR (Fracture, analysis of Vessels: Oak Ridge) computer code. FAVOR performs structural integrity analyses of embrittled nuclear reactor pressure vessels (RPVs) with stainless steel cladding, to evaluate compliance with the applicable regulatory criteria. Since the initial release of FAVOR, the HSST program has continued to enhance the capabilities of the FAVOR code. ABAQUS, a nuclear quality assurance certified (NQA-1) general multidimensional finite element code with fracture mechanics capabilities, was used to generate a database of stress-intensity-factor influence coefficients (SIFICs) for a range of axially and circumferentially oriented semielliptical inner-surface flaw geometries applicable to RPVs with an internal radius (Ri) to wall thickness (w) ratio of 10. This database of SIRCs has been incorporated into a development version of FAVOR, providing it with the capability to perform deterministic and probabilistic fracture analyses of RPVs subjected to transients, such as pressurized thermal shock (PTS), for various flaw geometries. This paper discusses the SIFIC database, comparisons with other investigators, and some of the benchmark verification problem specifications and solutions.

15465 (INIS-JP–027, pp. 3-7) **Toward autonomous operation and maintenance of nuclear power plants.** Kitamura, M. (Tohoku Univ., Sendai (Japan). Faculty of Engineering). Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

Issues toward realization of autonomous operation as well as maintenance of nuclear power plants are reviewed in this paper. First, the necessity and significance of the technical program aiming at the establishment of autonomous nuclear plant are discussed through reviewing the history and current status computerized operation of complex artifacts. Then, key technologies currently studied to meet the need within the framework of artificial intelligence (AI) and advanced robotics are described. Among such AI-technologies are distributed multi-agent system, operator thinking model, and advanced man-machine interface design. Advances in robot technology attained include active sensing technique and multi-unit autonomous maintenance robot systems. Techniques for simulation of human action have been pursued as basic issues for understanding mechanisms behind human behavior. In addition to the individual developments, methodological topics relevant to the autonomy of nuclear facilities are briefly addressed. The concepts called methodology diversity and dynamic functionality restoration (realization) are introduced and discussed as the underlining principles to be considered in the development of the autonomous nuclear power plants. (author).

15466 (INIS-JP–027, pp. 11-20) **Task oriented evaluation system for maintenance robots.** Asame, Hajime (Institute of Physical and Chemical Research, Wako, Saitama (Japan)); Endo, Isao; Kotosaka, Shin-ya; Takata, Shozo; Hiraoka, Hiroyuki; Kohda, Takehisa; Matsumoto, Akihiro; Yamagishi, Kiichiro. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

The adaptability evaluation of maintenance robots to autonomous plants has been discussed. In this paper, a new concept of autonomous plant with maintenance robots are introduced, and a framework of autonomous maintenance system is proposed. Then, task-oriented evaluation of robot arms is discussed for evaluating their adaptability to maintenance tasks, and a new criterion called operability is proposed for adaptability evaluation. The task-oriented evaluation system is implemented and applied to structural

design of robot arms. Using genetic algorithm, an optimal structure adaptable to a pump disassembly task is obtained. (author).

15467 (INIS-JP–027, pp. 21-32) **Geometric programming facilities of EusLisp and assembly goal planner.** Matsui, Toshihiro (Electrotechnical Lab., Tsukuba, Ibaraki (Japan)); Sakane, Shigeyuki; Hirukawa, Hirohisa. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

For robots in power plants to accomplish intelligent tasks such as maintenance, inspection, and assembly, the robots must have planning capabilities based on shape models of the environment. Such shape models are defined and manipulated by a program called a geometric modeler or a solid modeler. Although there are commercial solid modelers in the market, they are not always suitable for robotics research, since it is hard to integrate higher level planning functions which frequently access internal model representation. In order to accelerate advanced robotics research, we need a generic, extensible, efficient, and integration-oriented geometric modeler. After reviewing available modelers, we concluded that the object-oriented Lisp can be the best implementation language for solid modeling. The next section introduces the programming language, 'EusLisp', tuned for implementing a solid modeler for intelligent robot programming. The design philosophy and the structure and functions of EusLisp are stated. In the following sections, EusLisp's applications, i.e., viewpoint and light-source location planning, derivation of motion constraint, and assembly goal planning, are discussed. (J.P.N.).

15468 (INIS-JP–027, pp. 33-44) **Present status of an integrated software system for HASP (Human Acts Simulation Program).** Otani, Takayuki (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ebihara, Ken-ichi; Kambayashi, Shaw; Kume, Etsuo; Higuchi, Kenji; Fujii, Minoru; Akimoto, Masayuki. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

In Human Acts Simulation Program (HASP), human acts to be realized by a human-shaped intelligent robot in a nuclear power plant are simulated by computers. The major purpose of HASP is to develop basic and underlying design technologies for intelligent and automatic power plant. The objectives of this paper is to show the present status of the HASP, with particular emphasis on activities targetted at the integration of developed subsystems to simulate the important capabilities of the intelligent robot such as planning, robot dynamics, and so on. (author).

15469 (INIS-JP–027, pp. 45-56) **A measured-ZMP(Zero-Moment-Point)-referenced control of biped locomotion robots.** Kume, Etsuo (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Akimoto, Masayuki. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

For the control of biped locomotion, the model-referenced-control or programmed control method is widely used. In this method, the instantaneous torque of actuator equipped at each joint is controlled so as to equalize measured angle to input joint angle based on the prescribed motion. The drawback is that this method can not deal with the dynamic change of walking such as that due to unknown external force. To resolve such the drawback, we propose a new control method as follows: given a prescribed motion as a set of gait, namely gait of starting walk, cyclic walk, and stopping walk including a standard trajectory of the Zero-Moment-Point (ZMP), the trunk motion to compensate the legs' motion is generated in real time using the current ZMP measured by sensing device. The proposed method will be validated through some numerical simulations. (author).

15470 (INIS-JP–027, pp. 59-70) **Deep knowledge and knowledge compilation for dynamic systems.** Mizoguchi, Riichiro (Osaka Univ., Ibaraki (Japan). Inst. of Scientific and Industrial Research). Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

Expert systems are viewed as knowledge-based systems which efficiently solve real-world problems based on the expertise contained in their knowledge bases elicited from domain experts. Although such expert systems that depends on heuristics of domain experts have contributed to the current success, they are known to be brittle and hard to build. This paper is concerned with research on model-based diagnosis and knowledge compilation for dynamic systems conducted by the author's group to overcome these difficulties. Firstly, we summarize the advantages and shortcomings of expert systems. Secondly, deep knowledge and knowledge compilation is discussed. Then, latest results of our research on model-based diagnosis is overviewed. The future direction of knowledge base technology research is also discussed. (author).

15471 (INIS-JP–027, pp. 71-82) **Distributed and organized decision making under resource boundedness.** Sawaragi, Tetsuo (Kyoto Univ. (Japan). Faculty of Engineering). Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

The coming bottleneck to be overcome in the era of the distributed and open-architectured environment will be the establishment of the rational design and coordination of the total system where multiple decision makers, problem solvers and automated machinery components coexist interacting with each other. In such an environment, they are not achieving some absolute standard of performance with unlimited amounts of resources nor with simple algorithms, but is doing as well as possible given what resources one has. In this article, we focus on the potentials of decision theory as a tool for tackling with the limited rationality under resource boundedness. First, the bottlenecks for establishing the organized and distributed decision making are summarized, and the importance of the formalization of decision activities of intelligent agents is stressed to establish an efficient and effective cooperation by distributed and organized decision making and/or problem solving. Some of the practical systems developed based on such a principle are reviewed briefly with respect to the real-time man-machine collaboration and the cooperative computational framework for the intelligent mobile robots. (author).

15472 (INIS-JP–027, pp. 83-94) **Using Specification and Description Language (SDL) for capturing and reusing human experts' knowledge.** Far, B.H. (Saitama Univ., Urawa (Japan). Faculty of Engineering); Koono, Zenya. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

Conventional knowledge engineering techniques for acquiring experts' knowledge can not produce quality knowledge due to improper knowledge documentation and informal knowledge acquisition method. We propose a new method for knowledge documentation and acquisition using Specification and Description Language (SDL). SDL is used to describe both the target system and the reasoning process. The main idea is to follow deterministic problem solving behavior of human experts and document it. Then

knowledge can be extracted by comparing documents of the successive steps. This knowledge is recorded and reused in similar or novel cases. We present an implementation of this method in a tool for software design. The implemented system consists of a SDL CASE tool and an expert system for applying the design knowledge. This system serves as an experimental platform for the study of human design by simulating the design at the lowest level. However, we have found that by acquiring enough domain knowledge, this system can simulate general problem solving of human experts. (author).

15473 (INIS-JP–027, pp. 95-106) **A qualitative model construction method of nuclear power plants for effective diagnostic knowledge generation.** Yoshikawa, Shinji (Power Reactor and Nuclear Fuel Development Corp., Oarai, Ibaraki (Japan). Oarai Engineering Center); Endou, Akira; Kitamura, Yoshinobu; Sasajima, Munehiko; Ikeda, Mitsuru; Mizoguchi, Riichiro. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

This paper discusses a method to construct a qualitative model of a nuclear power plant, in order to generate effective diagnostic knowledge. The proposed method is to prepare deep knowledge to be provided to a knowledge compiler based upon qualitative reasoning (QR). Necessity of knowledge compilation for nuclear plant diagnosis will be explained first, and conventionally-experienced problems in qualitative reasoning and a proposed method to overcome this problem is shown next, then a sample procedure to build a qualitative nuclear plant model is demonstrated. (author).

15474 (INIS-JP–027, pp. 109-119) **Swarm Intelligence systems.** Beni, G. (California Univ., Reverside, CA (United States). Coll. of Engineering). Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

We review the characteristics of Swarm Intelligence and discuss systems exhibiting it. The recently developed mathematical description of Swarm behavior is also reviewed and discussed. The self-organization of Swarms is described as the reconfiguring asynchronously and conservatively of a distribution. Swarm reconfigurations are based on producing distributions that are solutions to systems of linear equations. Conservation and asynchronicity are related, respectively, to the global and local nature of the Swarm problem. The conditions for the convergence of the Swarm algorithm are presented. The important point is that, under very general conditions, the Swarm reconfigures in a time which is independent of the size of the Swarm. This fact implies that a centralized controller can never reconfigure as fast as a Swarm provided the size of the Swarm is large enough. This result is related to the unpredictability of the Swarm, a basic property of Swarm Intelligence. Finally, the conditions under which Swarm algorithms become of practical importance are discussed and examples given. (author).

15475 (INIS-JP–027, pp. 131-142) **Development of a super-redundant multijoint manipulator for maintenance of nuclear reactors.** Ma, Shugen (Ibaraki Univ., Hitachi (Japan). Faculty of Engineering); Hirose, Shigeo. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

A tendon-driven manipulator, the CT Arm, has a specific tendon traction transmission mechanism, in which a pair of tendons for driving a joint is pulled from base actuators via pulleys mounted on the based-side joints. The mechanism makes the most of the coupled drive function of the tendon tractions and thus enables the lightweight manipulator to exhibit enormous payload capability. By this tendon-driven mechanism, a multijoint manipulator with super-redundant degrees of freedom could be realized, which is suitable to the maintenance of nuclear reactors. In this article, we introduce the CT Arm and discuss the possibility to generate a multijoint maintenance manipulator which has a super-redundant degrees of freedom. (author).

15476 (INIS-JP–027, pp. 179-190) **Application of coupled symbolic and numeric processing to an advanced scheduling system for plant construction.** Kobayashi, Yasuhiro (Hitachi Ltd., Ibaraki (Japan). Energy Research Lab.); Takamoto, Masanori; Nonaka, Hisanori; Yamada, Naoyuki. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants.* Order Number DE95709894. Source: OSTI; NTIS; INIS.

A scheduling system has been developed by integrating symbolic processing functions for constraint handling and modification guidance, with numeric processing functions for schedule optimization and evaluation. The system is composed of an automatic schedule generation module, interactive schedule revision module and schedule evaluation module. The goal of the problem solving is the flattening of the daily resources requirement throughout the scheduling period. The automatic schedule generation module optimizes the initial schedule according to the formulatable portion of requirement description specified in a predicate-like language. A planning engineer refines the near-goal schedule through a knowledge-based interactive optimization process to obtain the goal schedule which fully covers the requirement description, with the interactive schedule revision module and schedule evaluation module. A scheduling system has been implemented on the basis of the proposed problem solving framework and experimentally applied to real-world sized scheduling problems for plant construction. With a result of the overall plant construction scheduling, a section schedule optimization process is described with the emphasis on the symbolic processing functions. (author).

15477 (WSRC-MS–95-0008) **Analytical considerations in the code qualification of piping systems.** Antaki, G.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950740–7: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95006473. Source: OSTI; NTIS; INIS; GPO Dep.

The paper addresses several analytical topics in the design and qualification of piping systems which have a direct bearing on the prediction of stresses in the pipe and hence on the application of the equations of NB, NC and ND-3600 of the ASME Boiler and Pressure Vessel Code. For each of the analytical topics, the paper summarizes the current code requirements, if any, and the industry practice.

2203 Fuel Elements

Refer also to citation(s) 14913, 15427, 15429, 15432, 15443, 15445, 15446

15478 (INIS-JP–029, pp. 60-62) **Basic study on the secondary hydride in zircaloy claddings by means of the nuclear reaction analysis.** Hattori, Takayuki (Kyoto Univ. (Japan). Faculty of Engineering); Hashizumi, Masatsugu; Takagi, Ikuji; Higashi, Kunio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Deuterium depth profiles in zircaloy claddings were observed with the nuclear reaction $D(^3He,p)^4He$. The concentration of deuterium in the zircaloy-2 cladding with a zirconium liner depended on the cooling rate after deuterium absorption at 673K. In the case of slow cooling rate, the deuterium concentration in the liner was

very high, while that in the zircaloy cladding was low. The zircaloy-4 cladding covered with nickel, absorbed more deuterium than that with base surfaces. (author).

15479 (ORNL/TM–12788) **Creep analysis of fuel plates for the Advanced Neutron Source.** Swinson, W.F.; Yahr, G.T. Oak Ridge National Lab., TN (United States). Nov 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008646. Source: OSTI; NTIS; INIS; GPO Dep.

The reactor for the planned Advanced Neutron Source will use closely spaced arrays of fuel plates. The plates are thin and will have a core containing enriched uranium silicide fuel clad in aluminum. The heat load caused by the nuclear reactions within the fuel plates will be removed by flowing high-velocity heavy water through narrow channels between the plates. However, the plates will still be at elevated temperatures while in service, and the potential for excessive plate deformation because of creep must be considered. An analysis to include creep for deformation and stresses because of temperature over a given time span has been performed and is reported herein.

15480 (STUDSVIK-N(H)–94-13) **Investigation of fuel behaviour at different power levels (SKI-bump II). Final report.** Lysell, G.; Bengtsson, Sven. Studsvik Nuclear, Nykoeping (Sweden). 1994. 73p. Order Number DE95626846. Source: OSTI; NTIS; INIS.

Fuel microstructure and fission product redistribution in the fuel and to the cladding inside were studied after a 'bump' irradiation of a high burnup rod up to maximum Linear Heat Rating (LHR) of 43 kW/m. Fission gas induced swelling of the fuel imposed a large strain on the cladding. Total gas release in the rod as well as the local release at two different LHRs were measured. Reference fuel not subject to the bump was examined with the same techniques as the bumped fuel.

2204 Control Systems

Refer also to citation(s) 17342, 17442

15481 (ANL/IFR/CP–83965) **A reconfigurable hybrid supervisory system for process control.** Garcia, H.E. (Argonne National Lab., Idaho Falls, ID (United States)); Ray, A.; Edwards, R.M. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941216–3: 33. Institute of Electrical and Electronic Engineers (IEEE) conference on decision and control, Orlando, FL (United States), 14-16 Dec 1994). Order Number DE95009909. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a reconfigurable approach to decision and control systems for complex dynamic processes. The proposed supervisory control system is a reconfigurable hybrid architecture structured into three functional levels of hierarchy, namely, execution, supervision, and coordination. While, the bottom execution level is constituted by either reconfigurable continuously varying or discrete event systems, the top two levels are necessarily governed by reconfigurable sets of discrete event decision and control systems. Based on the process status, the set of active control and supervisory algorithm is chosen. The reconfigurable hybrid system is briefly described along with a discussion on its implementation at the Experimental Breeder Reactor 2 of Argonne National Laboratory. A process control application of this hybrid system is presented and evaluated in an in-plant experiment.

15482 (IAEA–12-SP-384.37) **Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.** International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. 301p. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The main objective of the meeting is to provide a forum for exchange of information among the participating experts both at this meeting and later through the publication of the meeting's proceedings. The following topics are considered: experiences from use of information technology in the control room, including operator interfaces, operator support systems and complete control rooms; human aspects of introducing information technology in the control room; design and evaluation of advanced control rooms. 26 papers were presented at the meeting. A separate abstract was prepared for each of these papers. Refs, figs and tabs.

15483 (IAEA–12-SP-384.37, pp. 1-10) **APACS: Monitoring and diagnosis of complex processes.** Kramer, B.M. (Toronto Univ., ON (Canada)); Mylopoulos, J.; Cheng Wang. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes APACS - a new framework for a system that detects, predicts and identifies faults in industrial processes. The APACS frameworks provides a structure in which a heterogeneous set of programs can share a common view of the problem and a common model of the domain. (author). 17 refs, 2 figs.

15484 (IAEA–12-SP-384.37, pp. 11-19) **ISACS-1, a limited prototype of an advanced control room.** Follesoe, K. (Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt); Foerdestroemmen, N.; Haugset, K.; Holmstroem, C. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The concept of an Integrated Surveillance And Control System (ISACS) has been developed into a prototype, ISACS-1, which presently is in operation at the simulator-based experimental control room HAMMLAB of the OECD Halden Reactor Project. Characteristics of ISACS is that it covers the whole interface between the process and the operator, and this interface is fully computerized using tools like Cathode Ray Tubes (CRTs) and dynamic keyboards. In addition, a large number of computerized operator support systems (COSSs) are included in ISACS, assisting the operator in functions like disturbance detection and diagnosis, identification of relevant actions, and implementation of procedures. An information coordinator called "Intelligent Coordinator" (IC) in ISACS observes the information received from the process and the COSSs, generates new high-level information and structures and prioritizes information to be presented to the operator. The limited ISACS-1 prototype was completed in early 1991. An extensive evaluation programme is in progress. This paper will describe main features of the system and some of the conclusions to be drawn from the evaluation programme. (author). 5 refs, 2 figs.

15485 (IAEA–12-SP-384.37, pp. 20-23) **Occurrences in control room equipment, procedures and personnel performances: IRS control room events.** Tolstykh, V. (International Atomic Energy Agency, Vienna (Austria)). International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The IAEA/NEA Incident Reporting System (IRS) was established in the early 1980, its objective being to gain from operating experience achieved in countries with nuclear power programmes by

means of exchanging information on events relevant to safety. Among the 2171 events in the database, 175 events (i.e. 8%) were identified as "control room events". It was decided to group these into three sets for further study: 65 events with common mode/ cause failures (CCFs), 22 events with cognitive errors and 30 events with unforeseen interaction between NPP systems. It is expected that the pitfalls experienced in the IRS and the questions derived from this study will help to gain a better understanding of the needs and interests of specialists in advanced information methods and artificial intelligence in NPP control rooms. (author).

15486 (IAEA–12-SP-384.37, pp. 24-35) **Optimization of advanced plants operation: The Escrime project.** Fiche, C. (CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France)); Papin, B. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The Escrime program aims at defining the optimal share of tasks between humans and computers under normal or accidental plant operation. Basic principles we keep in mind are the following: human operators are likely to be necessary in the operation of future plants because we cannot demonstrate that plant design is error free, so unexpected situation can still happen; automation must not release the operators from their decisional role but only help them avoiding situations of cognitive overload which can lead to increase the risk of errors; the optimum share of tasks between human and automatic systems must be based on a critical analysis of the tasks and of the way they are handled. The last point appeared to be of major importance. The corresponding analysis of the French PWR's operating procedures enabled us to define a unified scheme for plant operation under the form of a hierarchy of goals and means. Beyond this analysis, development of a specific testing facility is under way to check the relevance of the proposed plant operation organization and to test the human-machine cooperation in different situations for various levels of automation. 7 refs, 4 figs.

15487 (IAEA–12-SP-384.37, pp. 36-47) **Experience with the upgraded VERONA-u WWER-440 core monitoring system.** Lux, I. (KFKI-Atomic Energy Research Inst., Budapest (Hungary)); Vegh, J.; Adorjan, F.; Buerger, L. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes the components, functioning and services of the VERONA-u core monitoring system recently installed at Unit 2 and 3 of the Hungarian Paks NPP. The VERONA-u is a totally upgraded and modernized version of the previous VERONA system, in the upgrading project the data-concentrator, the host computer and the operators' displays were replaced by state-of-the-art hardware and software components. Dual hardware redundancy and automatic function recovery actions were introduced in order to ensure high system availability. The man-machine interface has been redesigned completely, applying X Windows as Graphical User Interface. Improved core analysis and power reconstruction methods were introduced, together with a detailed hot-spot monitoring algorithm. A capable archivation module ensures periodic logging of all measured data, change sensitive storage of important signal changes and provides sophisticated post-mortem analysis tools. The upgraded system has been working satisfactorily on Unit 2 for a complete fuel cycle by now, the on-line system response in complex, transient situations is illustrated in the paper. (author). 10 refs, 4 figs.

15488 (IAEA–12-SP-384.37, pp. 48-57) **Experience from development and operation of the core surveillance systems SCORPIO.** Berg, O. (Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt); Porsmyr, J.; Adlandsvik, K.A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The main motivation behind the development of SCORPIO is to make a practical tool for reactor operators which can increase the quality and quantity of information presented on core status and dynamic behaviour. This can first of all improve plant safety as undesired core conditions are detected and prevented. Secondly, more flexible and efficient plant operation is made possible. These improvements are obtained by better surveillance of core instrumentation and through detailed calculations of core behaviour using on-line simulators. The SCORPIO system has two parallel modes of operation: the Core Follow Mode and the Predictive Mode. The system has been in operation at the Ringhals PWR unit 2 in Sweden since the end of 1987 where it runs on Norsk Data mini-computers. Recently, there has been a renewed interest for SCORPIO mainly determined by the utilities' desire to obtain more economical and flexible plant operation. The SCORPIO system has been transferred to Unix based workstations and integrated with the Picasso-2 graphics system. In addition to Ringhals the new system is currently being installed at Nuclear Electri's Sizewell B PWR in UK and Duke Power's Catawba Unit 1,2 and McGuire Unit 1,2, USA. (author). 7 refs, 5 figs.

15489 (IAEA–12-SP-384.37, pp. 86-93) **Guidelines for the presentation of emergency operating procedures using advanced information technology.** Green, M. (Human Reliability Associates Ltd., Dalton (United Kingdom)); Hollnagel, E.; Niwa, Yuji. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

New methods of information presentation and interface design are changing the conditions for work in the modern NPP control room. One area receiving considerable attention is that of Emergency Operating Procedures (EOP). Conventionally such procedures are presented using hard copy manuals; however, development in IT means that there are new opportunities for the computerization of such procedures. This paper reports on the development of human factors guidelines for the computerized presentation of EOPs. After identifying the principle stages in the transition from procedures as documents to fully automated procedures, computerised procedure presentation is briefly discussed. Guidelines for the presentation of such procedures are outlined starting with the high level goals for guidelines themselves. Such goals also constitute the criteria against which the computerized procedures are measured during implementation. Six dimensions describing computerized procedure presentation are presented and two are explore in more detail by identifying points along each dimension that characterize different levels of IT sophistication. (author). 8 refs, 1 tab.

15490 (IAEA–12-SP-384.37, pp. 94-101) **The proposed human factors engineering program plan for man-machine interface system design of the next generation NPP in Korea.** Oh, I.S. (Korea Atomic Energy Research Inst., Taejon (Korea, Republic of). Human Factors Technology Development Project); Lee, H.C.; Seo, S.M.; Cheon, S.W.; Park, K.O.; Lee, J.W.; Sim, B.S. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant

Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Human factors application to nuclear power plant (NPP) design, especially, to man-machine interface system (MMIS) design becomes an important issue among the licensing requirements. Recently, the nuclear regulatory bodies require the evidence of systematic human factors application to the MMIS design. Human Factors Engineering Program Plan (HFEPP), as a basis and central one among the human factors application by the MMIS designers. This paper describes the framework of HFEPP for the MMIS design of next generation NPP (NG-NPP) in Korea. This framework provides an integral plan and some bases of the systematic application of human factors to the MMIS design, and consists of purpose and scope, codes and standards, human factors organization, human factors tasks, engineering control methodology, human factors documentations, and milestones. The proposed HFEPP is a top level document to define and describe human factors tasks, based on each step of MMIS design process, in view point of how, what, when and by whom to be performed. (author). 11 refs, 1 fig.

15491 (IAEA–12-SP-384.37, pp. 102-110) **Expert system aided operator's mental activities training.** Gieci, A. (Nuclear Power Plants Research Inst., Trnava (Slovakia)); Macko, J.; Mosny, J.; Gese, A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The operator's mental activity is the most important part of his work. A processing of a large amount of the information by the operator is possible only if he/she possesses appropriate cognitive skills. To facilitate the novice's acquisition of the experienced operator's cognitive skills of the decision-making process a special type of the expert system was developed. The cognitive engineering's models and problem-solving methodology constitutes the basis of this expert system. The article gives an account of the prototype of the mentioned expert system developed to aid the whole mental activity of the nuclear power plant operator during his decision-making process. (author). 6 refs, 6 figs.

15492 (IAEA–12-SP-384.37, pp. 111-120) **Human factor in development and implementation of a computerized operator support system (COSS) at an operating power unit of the Novovoronezh NPP.** Scorodoumov, V.A. (Novovoronezh Nuclear Power Plant, Novovoronezh (Russian Federation). Computer Engineering Dept.); Smoutnev, V.I. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Basing on an actually existing standard procedure of implementation of any technical idea, a concept of an associated "human factor" chain is introduced in this paper. Each element of the chain is discussed in detail, in terms of problems encountered and practical ways of their elimination. Specific examples are given of problems arising and methods adopted for their solution, one of them being establishing working groups, consisting of experts from mutually complementing areas (e.g. programmers and process engineers), development of a common acceptable "communication language" for the working group, application of a "deep feedback" method between software designers and user-process engineers over the entire process of COSS development and stage-by-stage introduction. 2 figs.

15493 (IAEA–12-SP-384.37, pp. 121-126) **An approach to evaluate task allocation between operators and automation with respect to safety of Nuclear Power Plants.** Macwan, A. (Delft Univ. of Technology, Delft (Netherlands). Lab. for Measurement and Control); Wei, Z.G.; Wieringa, P.A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Even though the use of automation is increasing in complex systems, its effect on safety cannot be systematically analyzed using current techniques. Of particular interest is task allocation between operators and automation. In evaluating its effect on safety, a quantitative definition of degree of automation (doA) is used. The definition of doA accounts for the effect of task on safety, irrespective of whether the task is carried out by operator or automation. Also included is the indirect effect due to the change in workload perceived by the operator. This workload is translated into stress which affects operator performance, expressed as human error probability, and subsequently, safety. The approach can be useful for evaluation of existing task allocation schemes as well as in making decisions about task allocation between operators and automation. (author). 13 refs, 1 fig.

15494 (IAEA–12-SP-384.37, pp. 127-132) **Computer managed emergency operating procedures.** Salamun, I. (Ljubljana Univ., Ljubljana (Slovenia). Reactor Engineering Div.); Mavko, B.; Stritar, A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

New computer technology is a very effective tool for developing a new design of nuclear power plant control room. It allows designer possibility to create a tool for managing with large database of power plant parameters and displaying them in different graphic forms and possibility of automated execution of well known task. The structure of Emergency Operating Procedures (EOP) is very suitable for programming and for creating expert system. The Computerized Emergency Operating Procedures (CEOP) described in this paper can be considered as an upgrading of standard EOP approach. EmDiSY (Emergency Display System - computer code name for CEOP) main purpose is to supply the operator with necessary information, to document all operator actions and to execute well known tasks. It is a function oriented CEOP that gives operator guidance on how to verify the critical safety functions and how to restore and maintain these functions where they are degraded. All knowledge is coded and stored in database files. The knowledge base consists from stepping order for verifying plant parameters, desired values of parameters, conditions for comparison and links between procedures and actions. Graphical shell allows users to read database, to follow instruction and to find out correct task. The desired information is concentrated in one screen and allows users to focus on a task. User is supported in two ways: desired parameter values are displayed on the process picture and automated monitoring critical safety function status trees are all time in progress and available to the user. (author). 4 refs, 4 figs.

15495 (IAEA–12-SP-384.37, pp. 133-144) **Improving CANDU annunciation - Current R and D and future directions.** Lupton, L.R. (AECL Research, Chalk River, ON (Canada). Chalk River Laboratories); Feher, M.P.; Davey, E.C.; Guo, K.Q.; Bhuiyan, S.H. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant

Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Annunciation is used to ensure that control room staff are promptly alerted to important changes in plant conditions that may impact on safety and production goals. We are carrying out research and development to improve CANDU annunciation, in partnership with Canadian CANDU utility and design organizations. The main goal is to solve the "information overload" problem that occurs during major plant upsets, while providing operators with annunciation information needed to prevent, mitigate, and accommodate plant disturbances. To data, a set of annunciation concepts has been developed based on operational needs in a complex supervisory control environment. A prototype annunciation system has been developed and demonstrated with Point Lepreau Generating Station operations staff. Preliminary evaluations show that the system has the potential to solve many of the current problems associated with upset management. Further evaluation of this system is planned for 1994/95. This paper summarizes the project, including the current status, lessons learned to data, future directions of the research, and implementation by plants. (author). 9 refs, 3 figs, 1 tab.

15496 (IAEA–12-SP-384.37, pp. 145-154) **The development of functional requirement for integrated test facility.** Sim, B.S. (Korea Atomic Energy Research Inst., Taejon (Korea, Republic of). Human Factors Project); Oh, I.S.; Cha, K.H.; Lee, H.C.; Hollnagel, E.; Kontogiannis, T.; Embrey, D.E. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

An Integrated Test Facility (ITF) is a human factors experimental environment comprised of a nuclear power plant function simulator, man-machine interfaces (MMI), human performance recording systems, and signal control and data analysis systems. In this study, we are going to describe how the functional requirements are developed by identification of both the characteristics of generic advanced control rooms and the research topics of world-wide research interest in human factors community. The functional requirements of user interface developed in this paper together with those of the other elements will be used for the design and implementation of the ITF which will serve as the basis for experimental research on a line of human factors topics. (author). 15 refs, 1 fig.

15497 (IAEA–12-SP-384.37, pp. 155-165) **Prototype of an expert system based nuclear power plant information systems.** Vegh, J. (KFKI Atomic Energy Research Inst., Budapest (Hungary)); Bodnar, M.; Buerger, L.; Tanyi, M.; Sefesik, F. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The components and functioning of the GPCS information system applicable for intelligent process monitoring and alarm generation in a WWER-440 type nuclear power plant are described. The prototype system has been developed by using the G2 expert system, plant measurements were simulated by a WWER-440 compact simulator and by archive replay sessions performed by the VERONA-u core monitoring system. The GPCS contains an object oriented description of the basic subsystems of the plant and concentrates on the fast evaluation/displaying of measurements and alarms. The high-level information reflecting actual plant safety status is synthesized from primary measured data, by forming global alarms and by evaluating logical diagrams. (author). 10 refs, 4 figs.

15498 (IAEA–12-SP-384.37, pp. 166-174) **SACRI: A measure of situation awareness for use in the evaluation of nuclear power plant control room systems providing information about the current process state.** Hogg, D.N. (OECD Halden Reactor Project, Halden (Norway). Man - Machine Interaction Research); Follesoe, K.; Volden, F.S.; Torralba, B. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Control room operator support systems and their interface designs have as one goal the enhancement of the operators' situation awareness of the dynamically changing process state. This paper describes a technique for measuring situation awareness within the Human Factors evaluation of control room operator-system interfaces. The technique, referred to as SACRI, has been evaluated in four simulator studies and the main findings from these studies are summarized in this paper. It is concluded that SACRI can be a useful supplement to operator performance measures currently existing for use within control room interface evaluations. (author). 16 refs, 2 figs, 3 tabs.

15499 (IAEA–12-SP-384.37, pp. 175-184) **New generation main control room of enhanced safety NPP with MKER reactor.** Golovanev, V.E. (RDIPE, Moscow (Russian Federation)); Gorelov, A.I.; Proshin, V.A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Russia is planning to begin the gradual substitution RMBK NPP units, whose resources were worked out itself, to NPP units with a 800 MW multiloop boiling water power reactor (MKER-800) enhanced safety at next ten-year period. Main drawbacks of RBMK Reactor were completely removed in design of MKER-800 reactor. Moreover some special decisions were made to give MKER-800 self-safety properties. The proposed design of the MKER-800 enhanced safety reactor is not only fully free from the drawbacks of the RBMK reactors, but also show a number of advantages of channel-type reactors. This Paper presents some preliminary proposals of MCR Design, that developed Research and Development Institute of Power Energy (RDIPE). 6 refs, 2 figs.

15500 (IAEA–12-SP-384.37, pp. 185-196) **Contribution of qualitative analysis and fuzzy sets to industrial process fault diagnosis: Application to the DIAPASON project.** Montmain, J. (CEA Rhone Valley Research Center - Marcoule, Bagnols-sur-Ceze (France). Applied Computer Science Lab.); Leyval, L. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The construction of fault indicators is the foundation of model-based fault diagnosis. The development of precise mathematical models for complex facilities is generally difficult and expensive; new and less constraining techniques, notably seeking to account for behaviour, open new perspectives for fault detection and diagnosis. The authors propose a combined approach based on

quantitative processing with qualitative assessment of the results. A veritable numerical-symbolic interface then ensure a more satisfactory balance between the two levels of knowledge - analytic and heuristic - necessary to optimize the performance of a diagnostic procedure. Our supervision support system DIAPASON provides operators of industrial continuous processes with an aid to watch and diagnosis. The reasoning is based on a casual graph and on a knowledge base. After an overview of qualitative simulation, defect diagnosis and fault diagnosis, the way in which these three cooperate in DIAPASON is amplified. (author). 21 refs, 5 figs.

15501 (IAEA–12-SP-384.37, pp. 197-226) **Verification and validation of software related to nuclear power plant control and instrumentation.** Wall, N. (AEA Technology, Winfrith (United Kingdom). Control and Instrumentation Div.); Kossilov, A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

There has always been significant concern with introduction of software in industry and the nuclear industry is no different from any other sector save its safety demands are some of the most onerous. The problems associated with software have led to the well documented difficulties in the introduction of computer based systems. An important area of concern with software in systems is the processes of Verification and Validation. One of the many activities the IAEA is currently engaged in is the preparation of a document on the process of verification and validation of software. The document follows the safety classification of IEC 1226 but includes software important to plant operation to establish three levels of assurance. The software that might be deployed on a plant was then identified as one of four types: new software, existing software for which full access to the code and documentation is possible, existing software of a proprietary nature and finally configurable software. The document attempts to identify the appropriate methods and tools for conducting the verification and validation processes. (author). 5 refs, 5 figs, 7 tabs.

15502 (IAEA–12-SP-384.37, pp. 227-238) **Enabling technologies and methods for the retro-fitting of AI software into NPPS.** Pymm, P. (Scottish Nuclear, East Kilbride (United Kingdom). Engineering Div.). International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Scottish Nuclear have a number of plant monitoring and training applications at their operational nuclear power plant which could benefit from the introduction of artificial intelligence (AI) software. An outline of early work on two current AI developments in the areas of advanced operator aids and intelligent training is given. A generic workstation based engineering simulator (WES) which provides a prototyping environment for AI product application development and evaluation and development of human-computer interface (HCI) designs for plant installation is described. It is concluded that the WES architecture facilitates both migration of the prototype AI application to the plant and collaboration in the AI field between Scottish Nuclear and other organizations. (author). 1 ref., 6 figs.

15503 (IAEA–12-SP-384.37, pp. 239-248) **Diagnostic knowledge generation of nuclear power plants using knowledge compilers.** Yoshikawa, Shinji (Development Corp., Narita, Oarai (Japan). Power Reactor and Nuclear Fuel); Endou, Akira; Ikeda, Mitsuru; Mizoguchi, Riichiro. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

This paper discusses a method to generate diagnostic knowledge of nuclear power plants, from commonly accepted physical knowledge and design information about plant configuration. This method is based on qualitative reasoning, which is advantageous to numerical information processing in the sense that system can explain why and how directly applicable knowledge is correctly generated, and that knowledge base is highly reusable and expandable because it is independent on detailed numerical design specifications. However, reasoning ambiguity has been found as the largest problem in applying the technique to nuclear power plants. The proposed approach mainly consists of a knowledge representation scheme, reasoning algorithm, and qualitative model construction method. (author). 4 refs, 8 figs, 1 tab.

15504 (IAEA–12-SP-384.37, pp. 249-259) **Applications of autoassociative neural networks for signal validation in accident management.** Fantoni, P. (Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt); Mazzola, A. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The OECD Halden Reactor Project has been working for several years with computer based systems for determination on plant status including early fault detection and signal validation. The method here presented explores the possibility to use a neural network approach to validate important process signals during normal and abnormal plant conditions. In BWR plants, signal validation has two important applications: reliable thermal limits calculation and reliable inputs to other computerized systems that support the operator during accident scenarious. This work shows how a properly trained autoassociative neural network can promptly detect faulty process signal measurements and produce a best estimate of the actual process value. Noise has been artificially added to the input to evaluate the network ability to respond in a very low signal to noise ratio environment. Training and test datasets have been simulated by the real time transient simulator code APROS. Future development addresses the validation of the model through the use of real data from the plant. (author). 5 refs, 17 figs.

15505 (IAEA–12-SP-384.37, pp. 260-269) **The role of the artificial intelligence within the context of the human factors in the nuclear safety.** Bayout Alvarenga, M.A. (Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil)). International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

The effective evaluation of a human-machine system depends heavily on a cognitive model of the human behaviour. The basic question is: How can we model the human cognition? The response should be found in the five disciplines that form the Cognitive Sciences: Artificial Intelligence, Cognitive Psychology, Neurophysiology, Linguistic, and Philosophy. Among them, the Artificial Intelligence appears as the catalyzer of the contributions and discoveries in the other four, trying to realize that cognitive model with the tools of the Computer Science. Sometimes, it seems as if

these disciplines spoke different languages to describe the same ideas. It is necessary a holistic treatment of such questions that include the human cognition and its modelling. This becomes more clear when we observe that there are nowadays different methodologies that must be integrated in some way. This is the case of the symbolic approach (artificial intelligence), connectionist approach (neural networks) and the fuzzy logic. This paper makes a review of the available methodologies, showing the problems and the current solutions to answer the following question. How is possible to develop a human-machine system and an intelligent interface based on the Artificial Intelligence that fulfills the following characteristics: human-centered design, cognitive simulation of the human behaviour, and dynamic function allocation. This paper concludes with proposals of national projects to be applied to the Brazilian situation. (author). 28 refs.

15506 (IAEA–12-SP-384.37, pp. 270-277) **Evaluation of human fitness for duty in a real working situation.** Skof, M.M. (University Medical Centre Ljubljana, Ljubljana (Slovenia). Inst. of Occupational, Traffic and Sports Medicine); Molan, G. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

According to the results of root causes analyzes in the complex highly atomized systems almost 80% of reported events and scrams are due to the human error or malfunction. Nowadays scrams are mostly consequences of human mistakes. Human mistakes are according to the results of root cause analyses consequences of unfitness or inability to perform demanded task. Most of the workers in the system have adequate psychophysiological abilities and basic knowledge. So their performance in a real working situation depends on their fitness for duty or actual availability. Actual availability and consequently human performance depends on: Human abilities (basic human traits); human knowledge (knowledge received in education process and in special training); human motivation (willingness to take part in the activity). Actual availability is the interference of abilities, knowledge and motivation in the real situation and it shapes human performance. Workers are able to self estimate their fitness for duty. On these estimations modelling of human performance in a real situation is possible. By the level of human performance system's performance should be predicted. We have developed questionnaire VTP for self estimations of wellbeing, mood, fatigue, arousal level, stress and motivation. At the same time data indicating human performance have been collected. Indicators of human performance have been the results on dual task and effectiveness in primary task. Connections between human fitness for duty and human performance have been modelled. Developed model explain the impacts of particular factors of fitness for duty on systems performance. (author). 5 refs, 1 tab.

15507 (IAEA-IWG-NPPCI–92/2) **Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.** International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. 109p. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

The meeting of the IWG-NPPCI was organized in order to summarize operating experience of nuclear power plant control systems, gain a general overview of activities in development of modern control systems and receive recommendations on the further directions and particular measures within the Agency's programme. The meeting was held at the IAEA Headquarters in Vienna and was attended by twenty four national delegates and observers from 19 countries. The present volume contains: report on the meeting of the IWG-NPPCI, Vienna, 6 to 8 May 1991; report of the scientific secretary on th major activities of IAEA during 1989-91 in the NPPCI area; and reports of the national representatives to the International Working Group on NPPCI. The papers and discussions with practical experience and described actual problems encountered. Emphasis was placed on technical, industrial and economic aspects of the introduction of modern control systems and on the improvement of plant availability and safety. Refs, figs and tabs.

15508 (IAEA-IWG-NPPCI–92/2, pp. 13-31) **Report by the scientific secretary on major IAEA activities during 1989-1991.** Kossilov, A. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

Major IAEA activities in the field of nuclear power plant control and instrumentation in 1989-1991 are described: IAEA/OECD/NEA International Symposium on "Balancing Automation and Human Action in Nuclear Power Plants", Munich, Germany, 9-13 July 1990; specialists meetings; cooperation with OECD/NEA; a Review Report on "Control Rooms and Man-Machine Interface in Nuclear Power Plants"; Advisory Group Meeting on "The Balance Between Automation and Human Actions in NPP Operation"; use of simulators for training and maintaining competence; the guidelines for control room design; operator support systems in NPPs.

15509 (IAEA-IWG-NPPCI–92/2, pp. 33-34) **Nuclear power plant control and instrumentation activities in Argentina during 1989-1991.** Lorenzetti, J.R. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

A brief resume of the activities in the different areas of control and instrumentation is included. As there was a delay in the construction of the new power plant most of the effort were dedicated to the plants that they are in operation. It has been added instrumentation to have better information in the control room and to check new variables of the plant according with the experience learned from the operation. It was dedicated special strength in the areas of training simulators and in service inspection. (author).

15510 (IAEA-IWG-NPPCI–92/2, pp. 34) **Status of instrumentation and control activities in Austria, 1990-1991. Summary.** Nedelik, A. (Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

Status of instrumentation and control activities in Austria in 1990-1991 with the emphasis on research activities at the Technical University of Graz is outlined.

15511 (IAEA-IWG-NPPCI–92/2, pp. 35-41) **Highlights on nuclear power plant instrumentation and control activities in Belgium.** Naisse, J.C. (TRACTEBEL, Brussels (Belgium)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna

(Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

More than 60% of the electricity production in Belgium is covered by nuclear PWR plants. As no commissioning of new NPP'S is expected in the next years, the electricity equipment plant foresees installation of some additional 2000 MWE conventional producing capacity (coal and gas) until 1995. The main nuclear I and C activities in Belgium are related with improvement of: the safety of existing plants; the operation of existing plants; the training of operators; the waste storage facilities. (author). 3 figs.

15512 (IAEA-IWG-NPPCI–92/2, pp. 42-44) **Instrumentation and control in the Canadian nuclear power program - 1991 status.** Lepp, R.M. (Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

Shortly, Canada will have an installed nuclear capacity of 15,500 MWe. The 4 unit Darlington Nuclear Generating Station, which makes extensive use of computers for control and safety shutdown, is currently being connected to the Ontario Hydro grid. A significant effort is underway on technologies that will enhance the human-machine interface to meet more stringent plant availability and safety goals. This includes work on alarm annunciation, distributed control, plant display, relay logic replacement and software technology. These various initiatives and their benefits are discussed in the paper. (author). 6 refs.

15513 (IAEA-IWG-NPPCI–92/2, pp. 44-49) **Recent activities in the field of nuclear power plant control and instrumentation in Czechoslovakia.** Rubek, J. (Power Research Inst., Prague (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

The report presents a review of Czechoslovak nuclear power plants that are in operation and in the course of construction. The present state of the instrumentation of the newly built NPP's is described, and a special attention is given to work on the control of spatial power distribution in the reactor core of WWER 1000, the first unit to be installed in NPP Temelin. A project of a secondary circuit diagnostic system of this unit is described. (author). 6 refs, 1 tab.

15514 (IAEA-IWG-NPPCI–92/2, pp. 49-53) **Nuclear power plant control and instrumentation activities in Finland.** Haapanen, P. (Technical Research Centre of Finland, Espoo (Finland)); Wahlstroem, B. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

Finland has remarkable achievements in nuclear power. The existing four plants have some of the best operating records in the world - high capacity factors, low occupational doses and short refuelling outages. Public opinion was strongly turned against nuclear power after Chernobyl accident, and the previous government decided not to allow for the construction of a fifth nuclear unit during its period of reign. The opposition has however slowly been diminishing. According to the latest polls the opinion is almost balanced. Finnish power companies are going to file an application for a decision-in-principle to build a new plant to the new government appointed in April 1991. A readiness to start new construction project immediately after a positive political decision is made has been maintained during the intermediate period. Continuous research, development, modification and upgrading work provide important components of the good operational history of the Finnish nuclear power plants. Efforts have also been devoted to identifying possible new problems arising from the use of distributed digital C and I technology. The following a short description is summarizing recent activities related to the C and I-systems of the nuclear power plants. (author). 3 tab.

15515 (IAEA-IWG-NPPCI–92/2, pp. 54-57) **Recent developments in the field of nuclear power plant control and instrumentation in Hungary.** Pellionisz, P. (Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

A considerable percentage (32.8% in 1989) of electric energy in Hungary is produced by nuclear power plant Paks. The paper presents an overview of activities on control and instrumentation in the following areas: Control and instrumentation upgrading; training simulators; diagnostic systems. (author). 1 tab.

15516 (IAEA-IWG-NPPCI–92/2, pp. 58-60) **Nuclear power plant control and instrumentation in Italy.** Lantieri, A. (ENEA, Bologna (Italy). Dipt. Reattori Innovativi). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

The National Energy Plan (PEN) approved by the Government of Italy in August 1988 provides a programme of research and industrial development or reactors with inherent and passive safety features. For the Control Systems and Instrumentation there is the aim to define rules and design criteria, by evaluating the impact of inherent safety goals on the C and I design. The effort on man-machine interface is considered essential to increase safety and efficiency of advanced reactors. The paper briefly describes the activity in control systems and in the instrumentation area. (author).

15517 (IAEA-IWG-NPPCI–92/2, pp. 60-67) **Recent development of nuclear power in Japan and instrumentation and control system and control room equipment for advanced light water reactors.** Wakayama, N. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

This paper was provided for the 13th IAEA/IWG-NPPCI Meeting and aims to introduce an outline of recent development of nuclear power in Japan and some topics in the field of nuclear power plant control and instrumentation. Forty units of nuclear power plants are in operation in Japan and five units of BWRs and six PWRs are under construction. Construction of prototype FBR Monju have almost completed an construction of High-Temperature Engineering Test Reactor, HTTR, started in March 1991. In parallel of those, extensive effort has been carried out to develop the third generation

LWRs which are called Advanced BWR (ABWR) and Advanced PWR (APWR). Two Advanced BWRs are under safety review for construction. Instrumentation and control system of these Advanced LWRs adopts integrated digital I and C system, optical multiplexing signal transmission, fault tolerant control systems and software logic for reactor protection and safety systems and enhances plant control performance and provides human-friendly operation and maintenance environments. Main control room of these Advanced LWRs, comprised with large display panels and advanced console, has special futures such as one-man sit-down operation, human friendly man-machine interface, high level automation in operation and maintenance. (author). 7 refs, 9 figs, 1 tab.

15518 (IAEA-IWG-NPPCI–92/2, pp. 67-69) **Nuclear power plant control and instrumentation in the Netherlands: Status and developments.** Plas, Y. van der (Ministry of Social Affairs and Employment, Den Haag (Netherlands). Nuclear Safety Dept.). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

This article has been prepared for the regular IAEA/IWG-NPPCI-meeting in May 1991. It provides an outline of the status of and prospects for nuclear energy in the Netherlands and a brief description of topics given specific attention by the authorities. It also gives an overview of recent developments and aims related to I and C in nuclear power stations. (author).

15519 (IAEA-IWG-NPPCI–92/2, pp. 69-70) **Activities in the field of nuclear reactor instrumentation and control in Poland - 1991 status.** Mikulski, A.T. (Institute of Atomic Energy, Otwock-Swierk (Poland)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

The report gives a condensed overview of activity in the field of nuclear reactor instrumentation and control in Poland over the last few years. The work was performed parallel in two directions related to the construction of the first Nuclear Power Plant at Zarnowiec and to the changes made for two research reactors at Swierk. The first direction, according to government decision, was cancelled at the end of 1990 and the results obtained up to now are briefly summarized. The second one is in progress, some minor changes in I and C for the EWA reactor and significant improvements for the MARIA reactor are under way. The results of this activity are presented. (author). 6 refs.

15520 (IAEA-IWG-NPPCI–92/2, pp. 71-75) **Nuclear power plant control and instrumentation activities in Spain.** Blasco, J. (Consejo de Seguridad Nuclear, Madrid (Spain)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

The paper summarizes the principal activities in the field of Nuclear Power Plants Control and Instrumentation in Spain. The following activities are briefly described: Post-Accident Instrumentation; Safety Parameter Display System; Control Room Design Review; ATWS Mitigation System Actuation Circuit; Modifications at the Oldest Plants. (author). 2 tabs.

15521 (IAEA-IWG-NPPCI–92/2, pp. 75-79) **Report on the status of instrumentation and control in Swedish nuclear power plants.** Stroebeck, E. (Swedish State Power Board, Vaeroebacka, (Sweden). Ringhals Nuclear Power Plant). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclear power plants accounted for 46% of the total electric power production in Sweden in 1990. The availability of the Swedish reactors remains at a very high level. The oldest Swedish nuclear power plant has been in operation for nearly 20 years, and in the next 5 to 10 years a large portion of the NPP electrical equipment has to be replaced. The paper presents an overview of activities on control and instrumentation in the following: Future developments; implementation of computer-based systems; training simulators; nuclear safety research. The operating experience in Swedish nuclear power plants in 1991 is also presented. (author).

15522 (IAEA-IWG-NPPCI–92/2, pp. 80-82) **Nuclear power plant control and instrumentation in Switzerland.** Voumard, A. (Swiss Federal Nuclear Safety Inspectorate, Wuerenlingen (Switzerland). Federal Office of Energy). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

In Switzerland five NPPs are in operation and none is planned or is under construction. The three oldest NPPs are backfitted with an additional safety system. In the field of I and C, efforts are essentially directed to maintaining high performance and to improve the safety of the plants in operation. Three of these plants are about 20 years old and a significant part of their I and C equipment has to be replaced. This is an ongoing process which is carried out stage by stage mostly during the annual shutdown. Measures to avoid or mitigate severe accidents, including core melting, have been taken or are planned. (author). 1 tab.

15523 (IAEA-IWG-NPPCI–92/2, pp. 82-87) **National report on nuclear power plant control and instrumentation in the United Kingdom.** Goodings, A. (AEA Technology, Dorchester, Dorset (United Kingdom). Sensors and Instrumentation Dept.). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

This paper notes that, although no fundamental, NPPC and I technical developments have taken place in the UK since 1989, enormous organizational changes have occurred. The influence of these changes on instrumentation capability is discussed and the current situations on the Magnox, AGR and Fast Reactors and on the Sizewell PWR are described. Work on pulse-coded-logic reactor trip systems based on conventional microprocessor components is noted and a new, Dungeness B AGR, single channel trip systems which uses these principles is described. Other developments in sensors, instrumentation, ultrasonics and under-sodium viewing are also described as are studies on software reliability, human factors engineering and related topics. Comments are made on general aspects of computers in reactor safety systems. It is concluded that the last two years have seen considerable progress in the UK despite the interruptions and problems generated by organizational changes. It is felt that these changes may have produced a new sense of urgency and better insights into the needs of the industry. (author). 2 refs.

15524 (IAEA-IWG-NPPCI–92/2, pp. 87-95) **Development of monitoring, control and protection systems of nuclear power reactors in the USSR: Status and trends.** Kondrat'ev, V.V. (Research and Development Inst. of Power Engineering, Moscow (Russian Federation)); Mikhailov, M.N.; Prozorov, V.K.; Chudin, A.G. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

In 1989-90 the Supervision Body approved the new safety regulations for nuclear power plants. The operating plants do not always completely satisfy them and a great amount of work to develop operating power units up to the conditions required is necessary. This paper describes briefly the main changes made in monitoring, control and protection systems of nuclear power reactors to increase the reactor safety. The following fields are presented in the paper: General status of the NPP control and safety systems and instrumentation in USSR; sensors; electronic equipment; actuators improvement; qualification tests. (author). 3 figs.

15525 (IAEA-IWG-NPPCI–92/2, pp. 95-98) **Report on nuclear power plant instrumentation and control in Germany.** Bastl, W. (Gesellschaft fuer Reaktorsicherheit mbH (GRS), Garching (Germany)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes the status of the NPP control and instrumentation in Germany. The general technology underlying most aspects of NPP C and I in Germany has not altered since the last progress report although there has been many improvements in detail. Since the beginning of 1990 the GRS carried out the safety investigations of NPPs in East Germany. The USSR as the vendor of the plants and France were also involved in the project. The following fields are briefly described: Status of nuclear power in Germany; training simulators; backfitting of computers and information systems; operator support/new control rooms. (author). 6 refs, 1 tab.

15526 (IAEA-IWG-NPPCI–92/2, pp. 98-106) **General overview of recent developments and future prospects for instrumentation and control activities in France.** Furet, J. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Electronique et d'Instrumentation Nucleaire). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1992. (CONF-9105457–: Meeting of the International Working Group on nuclear power plant control and instrumentation, Vienna (Austria), 6-8 May 1991). In *Nuclear power plant control and instrumentation 1991. Working material. Proceedings of the regular meeting held in Vienna, 6-8 May 1991.* 109p. Order Number DE95627978. Source: OSTI; NTIS (US Sales Only); INIS.

Status of the NPP program development is recalled. The result of operational experience in 1990 is given. About 75% of electrical energy production was furnished by NPP. The main lines of the R and D program concerning future PWR and European Fast Breeder project are recalled. The latest achievements in design and I and C concern: IN CORE and EX CORE neutrons detectors for PWR high temperature neutrons detector for EFR - Test results in hard environment of new Instrumentation hardware in PWR containment building - new control and safety algorithms for future PWR safety and control systems. The effort on "Verification and Validation" of real time software is based on the use of an efficient tool. (author).

15527 (IAEA-IWG-NPPCI–93/1) **Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.** International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. 322p. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

With a view to exchanging information on most recent development of technology in the field the IAEA International Working Group on Nuclear Power Plant control and Instrumentation suggested to organize a Specialists' Meeting on "Operating Procedures for Nuclear Power Plants and their Presentation". The meeting was held in Vienna, at IAEA Headquarters from March 31 to April 2, 1992 and provided an opportunity to: share operators experience; discuss the different techniques of presenting the information; identify further trends of technology and needs of the industry. The meeting was attended by 46 participants representing 12 Member States and 3 international organizations. The present volume contains summary of the meeting, session summaries and papers of the national participants. Refs, figs and tabs.

15528 (IAEA-IWG-NPPCI–93/1, pp. 19-39) **Situation for plant procedures among the members of the WANO-Paris Centre.** Hoensch, V. (World Association of Nuclear Operators, Paris (France)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The paper discusses results of a workshop on "Development and Qualification of Plant Procedures" performed by the WANO-Paris Centre, Germany, March 12-14, 1991. 1 ref., 13 figs.

15529 (IAEA-IWG-NPPCI–93/1, pp. 41-56) **Operating and training technical documentation production and management system.** Abercrombie, S. (Ontario Hydro, Tiverton, ON (Canada). Bruce Nuclear Generating Station 'B'). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Bruce Nuclear Generating Station 'B' (BNGS 'B') consists of 4 Pressurized Heavy Water Reactors each with a maximum continuous rating of 930 MW. The station, located on the shore of Lake Huron in Ontario Canada, is part of Ontario Hydro's Bruce Nuclear Power Development. System Operating Manuals specify the actions that must be taken to safely operate the plant systems during specified standard, non-standard and abnormal operating conditions. This paper outlines the current project of rewriting and maintaining the plant system operating and training manuals. The principle goals are to make the new manuals: (a) Current; (b) Technically accurate; (c) User friendly; (d) Easy to revise. The paper looks at the rationale and justification for the project. All phases of the documentation process are explored. Each area examined will draw out the advantages and benefits over the previous system. The creation of a new Overall Unit Operating Manual will be reviewed highlighting it's beneficial contribution to plant operations. (author). 2 figs, 2 tabs.

15530 (IAEA-IWG-NPPCI–93/1, pp. 57-65) **Brief summary of incident reporting system events with procedural deficiencies.** Tolstykh, V. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Safety). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In

Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992. 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Since 1983 the Agency has been gathering information on NPP unusual events considered important for safety and accident prevention. The more than a thousand unusual events in the Incident Reporting System (IRS) contain considerably more lessons learned for the international operational experience feedback process. This summary of IRS recent events gives information on procedural failure (no single person is responsible for the accuracy of a procedure, the production of procedure is multifaceted). Emphasis in the IRS event patterns analysis was given to two aspects: Incomplete procedure (usually an equipment failure initiates a transient, and then the corresponding procedures failed to provide enough information); incorrect procedure (as with incomplete procedure, this problem usually occurs when trying to respond to a plant transient). (author). 2 tabs.

15531 (IAEA-IWG-NPPCI–93/1, pp. 69-81) **Safety aspects and human factors in emergency procedure analysis: A survey of GRS activities.** Beraha, D. (Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS) mbH, Garching (Germany)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

A survey of the German Risk Study project activities is presented, including an evaluation of the role of accident management procedures and human factors in safety analysis, description of the test control room, discussion of methodology of procedure analysis. 7 figs.

15532 (IAEA-IWG-NPPCI–93/1, pp. 83-96) **Embalse NGS: Abnormal event procedures development lifecycle.** Batistic, J.A. (Comision Nacional de Energia Atomica, Cordoba (Argentina). Central Nuclear Embalse). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Based on the present used philosophy in Canada and in Atucha Nuclear Generating Station (Argentina) it was decided to develop the Abnormal Event Procedures (EOP's) in a logical diagram format. The EOP's have in general two parts: the diagnosis and the operative action to mitigate the event. Some serious incidents can be resolved by the EOP's, but the philosophy is first, to satisfy the EOP's requirements. Taking into account the operating experience, the Final Safety Report and the results of simulations done by appropriate codes, it was possible to obtain the corresponding sequence for each abnormal event. With the information available in the Control Room (windows, alarms, trends, etc) for each part of the EOP's was associated the instrumentation that the operator must observe. 3 figs.

15533 (IAEA-IWG-NPPCI–93/1, pp. 97-107) **The plant operating procedure information modeling system for developing human-factored emergency procedures.** Fanto, S.V. (Westinghouse Electric Corp., Pittsburgh, PA (United States). Nuclear and Advanced Technology Div.); Petras, D.S.; Reiner, R.T.; Bastien, R.; Orendi, R.G.; Aheimer, G.A. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

As a result of the accident at Three Mil Island, regulatory requirements were issued to upgrade Emergency Operating Procedures (EOPs) for nuclear power plants. The use of human-factored, function-oriented, EOPs were mandated to improve human reliability and to mitigate the consequences of a broad range of initiating events, subsequent failures and operator errors, without having to first diagnose the specific events. The Westinghouse Owners Group (WOG) responded by developing Emergency Response Guidelines (ERGs) in a human-factored, two-column format to aid in the transfer of the improved technical information to the operator during transients and accidents (i.e., periods of high stress). The Emergency Response Guidelines are a network of 43 interrelated guidelines which specify operator actions to be taken during plant emergencies to restore the plant to a safe and stable condition. Each utility then customizes these two-column format ERGs to produce plant specific EOPs. Since the creation and maintenance of this large web of interconnecting EOPs is an extremely complex task, a computerized system was developed to address the administrative and regulatory requirements for maintaining the EOPs and the associated supporting documentation. The Plant Operating Procedure Information Modeling (POPIM) system was developed to provide procedure documentation specialists with a controlled, database-driven means to build and maintain human-factored procedures and their supporting documentation. The POPIM system is a software package which integrates off-the-shelf word processing, database management, and optical scanning microcomputer software, resulting in a menu-driven computerized tool that aids the procedure documentation specialist in this time-consuming and tedious effort. 1 fig.

15534 (IAEA-IWG-NPPCI–93/1, pp. 109-121) **The new modular emergency procedure concept for SIEMENS PWRs.** Mueller, R.E. (Siemens AG Unternehmensbereich KWU, Erlangen (Germany)); Moser, H.J.; Roth-Seefrid, H. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The new modular procedure concept which is being implemented in German PWRs meets the increasing requirements on clarity, manageability and human factors optimization while keeping the efforts involved in updating, reproduction and storage on an acceptable level. The concept uses three levels of detail for presenting the required information: strategy chart with automatic and manual action modules, resolution of action modules into individual actions and background information, resolution of individual actions into detailed step programs. The procedures are written with the aid of an electronic publishing software that runs on multiple platforms such as Unix work stations, MS-DOS Pcs and Macintosh computers. To facilitate the generation of new procedures the action modules will be stored in a relational databank containing all relevant plant specific information. Verification of thermalhydraulic plant behaviour is done by computer simulation at the time of development. Use of the plant analyzer developed by SIEMENS is envisaged. Final man-machine interface validation is done by full scope simulators during training sessions of reactor operators. Future development will be directed to combine the event-oriented and the safety-function oriented approaches to a fully harmonized concept and to integrate the new modular procedures format into the computerized control room of the cockpit type being developed by SIEMENS. (author). 3 refs, 4 figs.

15535 (IAEA-IWG-NPPCI–93/1, pp. 123-129) **Principals and development strategies for procedures with a focus on abnormal situations.** Engqvist, A. (Vattenfall AB, Vaellingby (Sweden)); Lehto, T.; Jansson, B. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their

presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The nuclear industry use procedures to provide that different tasks are performed in a controlled way. Procedures are used in normal and abnormal situations, and are supposed to support the operators as much as possible in different sequences. But also the management level needs guidance in incident situations to support decision making. There must, for example, be a procedure for a change in the operation mode of the feed-water system, when the demand is to perform correctly without mistakes rather than performing within time limits, as well as procedures for complex incident sequences, when the demand is to perform within given time limits in a acceptable way. This paper describes the Vattenfall Forsmarksverket approach to solve the procedure complex. Forsmarksverket is a BWR-site with three plants of the ABB Atom advanced reactor design with internal circulation pumps. Two of the plants are twins with a net electrical output of 1000 MW each, they were taken in commercial operation in 1980 and 1981, and the third plant is a 1200 MW net electrical output plant in commercial operation in 1985. (author). 2 figs.

15536 (IAEA-IWG-NPPCI–93/1, pp. 137-153) **The development of the operating procedures for Sizewell 'B' PWR.** McIntyre, P.J. (Nuclear Electric plc, Knutsford (United Kingdom). PWR Project Group). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

In order to operate a power station safely and efficiently the operating staff requires direction from the designers both of the plant and of the administrative systems within which the station must be operated. This direction is provided in written form via operational documentation. At Sizewell 'B', a 4-loop Westinghouse based PWR power station, due to raise power during 1994, an extensive programme of work is being undertaken to provide a highly useable set of procedures for operation of the station. This programme has been built on Nuclear Electric's experience on its gas-cooled reactor power stations and on PWR operational experience worldwide. This paper briefly describes the structure of the operating procedures at Sizewell 'B' and the approach taken to ensure a consistent and high quality presentation to the user. The paper describes in more detail the development of the control room procedures and focuses particularly on their presentation to the operator, verification and validation, and the interrelationship with Man-Machine Interface, staffing and training development. (author). 4 figs.

15537 (IAEA-IWG-NPPCI–93/1, pp. 155-161) **Operating procedures within the quality assurance programme.** Chen Chengkai (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power); Pieroni, N. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The quality assurance programme for nuclear power plant operation provides an interdisciplinary approach to all activities affecting quality. The quality assurance programme documentation includes various types of procedures. Programmatic procedures represent administrative tools for directing the total effort in a planned and systematic manner. Work-oriented procedures are used to perform and control work processes. As appropriate, the format and content of procedures should be standardized. Each procedure is reviewed and approved, prior to initial use. Temporary procedures are subject to the same review, approval and verification processes as normal procedures. The plant management has the main responsibility to ensure and verify that the operating procedures are effectively implemented. Verification of implementation of procedures includes techniques such as surveillance of activities, examination of records, interview of personnel and audits. 6 refs.

15538 (IAEA-IWG-NPPCI–93/1, pp. 163-175) **Procedures development: Common deficiencies and possible solutions.** Grenn, M. (Human Reliability Associates Ltd., Dalton, Wigan (United Kingdom)); Livingston, A.D. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Procedures, particularly emergency operating procedures (EOPs), are an important method of operator support and one which appears to be particularly vulnerable to problems. Any deficiencies in this area are likely to result in reduced human reliability and hence lead to a lower level of overall system reliability and availability. This paper outlines recent research carried out for the IAEA, aimed at identifying and evaluating the factors affecting procedural support in emergencies and abnormal incidents. These factors have been developed into a comprehensive classification scheme of procedural deficiencies. This classification scheme was based on findings from literature reviews, interviews with NPP personnel responsible for EOP development, and assessment of the effectiveness of procedures during a number of documented NPP incidents. The resultant classification scheme goes beyond identifying deficiencies which manifest themselves in the procedures (e.g. technical inaccuracies and incompleteness), to more detailed areas pertinent to the procedures development life cycle and its relationship to training. It is proposed that deficiencies within these areas are the cause of many of the problems which appear in procedures. It is these 'root causes' which must be addressed if procedures are to provide an effective means of operator support. Further analysis of incidents using the above classification scheme identified weaknesses in current incident reporting systems which prevent effective identification of, and therefore solutions to, these more fundamental deficiencies. (author). 14 refs, 2 figs.

15539 (IAEA-IWG-NPPCI–93/1, pp. 177-188) **The computerised procedure system COPMA-II.** Teigen, J. (OECD Halden Reactor Project, Halden (Norway). Inst. for Energiteknikk); Ness, E. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

COPMA (Computerised OPeration MAnuals) is a computerised procedure following system developed at the OECD Halden Reactor Project. The first version of the COPMA system became operational in 1989. Based on the experiences made with the first version we are now developing a second version; COPMA-II. The COPMA-II system will consist of three main components as described in this paper: (1) A procedure editor used by the procedure writer for entering and editing procedures written in a dedicated procedure language. (2) A procedure database containing the procedures generated by use of the procedure editor. (3) The COPMA-II On-line system which is intended to assist process operators in retrieving and executing procedures. The On-line system may be connected to the process computer so that COPMA may automatically read the values of process parameters referred in the procedures. These values can be used by COPMA to automatically determine the correct flow of control in the procedure based on the current state of the plant (as specified by the procedure writer).

COPMA may also support continuous monitoring of process conditions and provide the operator with a notification when some condition monitored becomes fulfilled. By use of the on-line connection to the process computer, the operator may initiate manipulations of process components from the On-line system. COPMA-II will be available on general purpose Unix workstations. Both the procedure editor and the COPMA-II On-line system are designed as window-oriented applications based on X-Windows and with man-machine interfaces composed of components adhering to the OSF/Motif standard for look and feel. (author). 9 refs, 3 figs, 1 tab.

15540 (IAEA-IWG-NPPCI–93/1, pp. 189-202) **The application of symptom-based operating procedures to UK gas-cooled reactors.** Jenkinson, J. (Nuclear Electric plc, Barnwood (United Kingdom). Human Factors Section). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The use of symptom-based procedures has now become well established on water reactor plants throughout the world. As part of a programme of enhancements to magnox and Advanced Gas-Cooled Reactor plants Nuclear Electric in the UK is developing fault management procedures based on the critical safety function approach which will be known as Symptom-Based Emergency Response Guidelines. Current initiatives are examining the role of operators in abnormal situations and the provision of additional operator support to enhance operator performance in Beyond Design Basis faults. Operating procedures have for too long been 'allowed to happen' as part of an overall design approach. This is no longer defensible. Operating procedures should be 'designed', against specific acceptability criteria, in the same way as any other part of the operator interface as part of a structured approach to interface design. Using an initial pilot SBERG a structured evaluation was carried out, involving operating staff from one shift at the pilot plant. A documentation package was produced consisting of introductory material to explain the nature of the trial, the SBERG Entry Checklist, the pilot SBERG, and a user questionnaire. This paper outlines the work being carried out and discusses certain human factors issues which arise from the evaluation results. The work has brought to light a number of issues concerning procedure design, together with user and usability criteria. Initial assumptions about the nature of suitable advice to support operators in beyond-design basis situations have been justified and the work indicates ways in which the pilot product can be improved and enhanced. The work provides a basis for a programme cover the provision of SBERGs for a number of Magnox and Advanced Gas-Cooled plants. (author). 3 refs, 3 figs, 5 tabs.

15541 (IAEA-IWG-NPPCI–93/1, pp. 203-209) **Computerized system for procedures execution monitoring.** Lipner, M.H. (Westinghouse Electric Corp., Pittsburgh, PA (United States)); Pitcairn, F.S.; Bastien, R. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

To assist plant operations personnel in assessing the overall status of the plant in both normal and emergency conditions, a CRT-based Computerized Procedures system, COMPRO, was developed. COMPRO utilizes the written procedures as the basis for textual displays and prompts which guide the operator through the procedures and at the same time provide parallel information about relevant plant parameters. By presenting this information in parallel the operator always sees where he is in the context of the overall plant response. The purpose of the system is (1) to guide the user step by step through the procedures by monitoring the appropriate plant data, by processing the data and by identifying the recommended course of action and (2) to provide the necessary parallel information which allows the user to assess other plant conditions which may require attention. The COMPRO system makes use of prompts which are clear and understandable. Any cursor control device may be used for user input to the system. A powerful relational data base management system (RDBMS) is embedded within COMPRO. A relational data base consists of a series of tables which are logically interrelated. A relational data base management system is a software system which facilitates the management of these tables. A RDBMS automatically provides the functions of (1) accepting data and instructions from users, (2) retrieving information from the data base, (3) updating the data base and (4) formatting and outputting data to users. COMPRO uses the data base to store all the data required to generate a procedure. Since this data exists external to the COMPRO software, changes can be made to the data without requiring manual changes to the software code. (author). 1 fig.

15542 (IAEA-IWG-NPPCI–93/1, pp. 211-240) **Operating procedures and maintenance documentation presentation for a NPP control room personnel.** Buchstab, Y.A. (Institute of Application Mathematics of Russian Academy of Sciences, Moscow (Russian Federation). Research and Development Inst. of Power Engineering); Michailov, M.N.; Sazonov, N.A. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

System of operating procedures and maintenance documentation presentation to NPP unit operating personnel (system "HYD") is considered in the paper. This system is developed on the base of a hypertext computer technology. Data of documentation volume on unit operating personnel working places and manner of its utilization are presented. "HYD" principles of operation are considered. Stages of the system installation at Leningrad NPP and current state of design are described. (author). 7 figs, 3 tabs.

15543 (IAEA-IWG-NPPCI–93/1, pp. 241-253) **A methodology for determining the optimal procedure basis for nuclear power plant operation.** Bardsley, A.S. (SRD, AEA Technology, Culcheth (United Kingdom)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Due to the complex nature of Nuclear Power Plant operations several different approaches to procedure structure, and content have been developed. This paper presents a methodology for basing the decision of procedure format selection on a more rational basis. Several operating scenarios are used and the methodology is applied to these; determining the procedure format based on the type of tasks performed. There are different formats on which to base procedures. This basis depends on the cognitive demands placed on the operator by the procedures. The types of procedure looked at are event-based procedures, where the operator must diagnose the event before the procedure is selected, and state-based procedures where the operator needs to identify the plant state to be reached, without needing to identify the particular event. This paper describes eleven factors based on features of Nuclear Power Plants which are used to determine attributes for the types of tasks to which the methodology is applied. By matching the task attributes to the needs of the procedural basis the best choices for different tasks can be judged. The analysis suggests that for normal operations and anticipated transients event-based procedures are best, with the provision of fall-back state-based

procedures. State-based procedures should be available for multiple failure events or where diagnosis is not possible. Also, this paper discusses the impact of computerization on the different types of procedure bases. Different levels of computerization are studied from a simple library to artificial intelligence. General conclusions are given, suggesting that computerization of event-based procedures would provide some benefit, and that improvements to state-based procedures would only be effective if expert systems were developed. Full automation of emergency operating procedures seems possible using Artificial Intelligence systems, but the development costs would be high. (author). 1 ref., 8 tabs.

15544 (IAEA-IWG-NPPCI–93/1, pp. 261-274) **Unit shutdown software.** Tschiesche, J. (Ustav Jaderneho Vyzkumu a.s., Rez (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The paper Unit Shutdown Software contains a description of software which is to be used by the WWER 440 type NPP unit manager during unit shutdown operations. The software enables to display measured or calculated values on the basis of real-time technological process data acquisition, provides advices during unit shutdown and, in the cases when there is a faulty intervention or inception of dangerous situation during the unit shutdown process, produces warnings. (author). 4 figs.

15545 (IAEA-IWG-NPPCI–93/1, pp. 275-286) **Some issues of significant electric equipment data presentation to operating personnel.** Dopjera, J. (Nuclear Power Plants Research Inst., Trnava (Czech Republic)); Kubanyi, J.; Gese, A.; Zofcik, S.; Jankovic, M. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Operating experience data of Czechoslovak as well as foreign WWER-440 nuclear power plants document that faults and failures of electric equipment should be the subject of large care. The aim of research and development (R and D) effort in Nuclear Power Plants Research Institute (NPPRI) in this area is implementation of advanced technical systems for plant safety and reliability related electric components and systems, including power supplying systems of instrumentation and control, monitoring and assessment. Some results of R and D effort in NPPRI in the field of obtaining of high quality and complex electric equipment data, their transfer and possible presentation of carefully selected information to the operator are given in the paper. An example of implementation of a technical system that serves for organized measurement and simultaneously for continuous monitoring, automatic fault conditions recording, relevant data processing and assessment is presented in the paper. These issues concern also the general problem of establishing new plant technical specifications and limiting working conditions in connection with running WWER-440's modernization processes. (author). 6 refs, 1 fig.

15546 (IAEA-IWG-NPPCI–93/1, pp. 287-302) **Operating procedure and operator's decision-making process.** Gieci, A. (Nuclear Power Plants Research Inst., Trnava (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

The paper presents some new views on the field of the creation of efficiently usable operating procedures. In addition to some rather traditional analyses of job type or task-analysis used up to now in instruction assembly there is cognitive-tasks analysis presented. Using the last mentioned approach such operator's recognitive activity requirements are investigated, which apply in the situations where operator's decision problems are solved. It is known that man's recognitive activity has its own rules. Therefore we attempted to propose such operating procedures which are able with respect to its form and contents to help an operator to recognize a failing situation correctly and to solve it regularly. The expert systems technology has appeared to be necessary for implementation of such support system. (author). 5 refs, 5 figs.

15547 (IAEA-IWG-NPPCI–93/1, pp. 303-313) **Recent advancement in the area of Man-Machine Interface.** Swaton, E. (International Atomic Energy Agency, Vienna (Austria)); Kossilov, A. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1993. (CONF-9203321–: Specialists meeting on operating procedures for nuclear power plants and their presentation, Vienna (Austria), 31 Mar - 2 apr 1992). In *Operating procedures for nuclear power plants and their presentation. Working material. Proceedings of a specialists meeting held in Vienna, 31 March - 2 April 1992.* 322p. Order Number DE95627979. Source: OSTI; NTIS (US Sales Only); INIS.

Automation and Operator Support Systems, as well as Man-Machine Interface were always in the scope of major IAEA activities. Many technical, economic and safety aspects have been discussed at IAEA meetings and have been included in the IAEA Programme. The Agency co-operates closely with other organizations to promote better understanding of all problems concerning the subject area. The paper describes the relevant IAEA activities in the framework of the Division of Nuclear Safety and the Division of Nuclear Power. (author). 10 refs, 2 figs.

15548 (IAEA-IWG-NPPCI–95/1) **Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.** International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. 375p. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

In September 1991, the IAEA Committee for Contractual Scientific Services approved the Co-ordinated Research Programme (CRP) on "Operator Support Systems (OSS) in Nuclear Power Plants" in the framework of the Project "Man-Machine Interface Studies". The main objective of the programme is to provide guidance and technology transfer in the development and implementation of OSSs, including the experience with man-machine interface and closely related issues such as instrumentation and control, the use of computers, and operator qualification. The third meeting of the CRP participants was held in Rome/Italy, from 10 to 14 October 1994 and was sponsored by the ANPA. The meeting reviewed the progress of the CRP tasks, considered the reports of national activities in the subject area and agreed on the time scheduled for the preparation of the final report. The present volume contains: materials prepared by the CRP meeting; list of the CRP participants; and reports presented by the national delegates. Refs, figs and tabs.

15549 (IAEA-IWG-NPPCI–95/1, pp. 31-36) **National report Netherlands KEMA.** Loriaux, E.F. (KEMA, Arnhem (Netherlands)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October*

1994. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

COPMA is a product of the OECD Halden Reactor Program (HRP). It is a COmputerized Procedures MAnual. The product is in an evaluation phase. Through KEMA's associated membership this product was evaluated by representatives of the two Dutch Nuclear Power plants, EPZ PWR plant in Borssele and GKN BWR plant Dodewaard. This presentation is a summary of the report.

15550 (IAEA-IWG-NPPCI–95/1, pp. 37-44) **Task leaders reports.** Loriaux, E.F.; Jehee, J.N.T. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

Report on CRP-OSS Task 4.1.1. "Survey of existing documentation relevant to this programme's goals" and report on CRP-OSS Task 4.1.2. "Survey of existing Operator Support Systems and the experience with them" are presented. 2 tabs.

15551 (IAEA-IWG-NPPCI–95/1, pp. 45-73) **National report from Norway.** Haugset, K. (Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

Review of activities and objectives in the area of creating operator support systems in nuclear power plants in Norway is presented. Development of a computerised alarm system for HAMMLAB (CASH) is described. A measure of situation awareness for use in the evaluation of nuclear power plant control room systems providing information about the current process state is discussed.

15552 (IAEA-IWG-NPPCI–95/1, pp. 75-112) **National report from Romania.** Bengulescu, D. (Institute of Atomic Physics, Bucharest (Romania)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

Review of objectives and activities in the area of creation operator support systems(OSS) in nuclear power plants in Romania is presented. Task 4.4.3. "Develop requirements for techniques and tools for developing OSS and document existing ones" is described. The following subjects are also discussed: development of computerised OSS for CANDU NPP; Cernavoda probabilistic safety evaluation project; rule-based and neural network-based expert systems in the Romanian safety research; an OSS for PHWR spent fuel bay; studies on an OSS in CANDU-6 NPP; Cernavoda probabilistic safety evaluation and utilization of results to improve nuclear power plant safety. 51 refs.

15553 (IAEA-IWG-NPPCI–95/1, pp. 113-127) **The current status of the operator support systems. The Russian Federation.** Golovanov, V. (Consyst Co. Ltd, Moscow (Russian Federation)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The current status of the operation support systems(OSS) for nuclear power plant in Russian Federation is described, including the following issues: regulatory foundation for the OSS development; the safety parameter display system(SPDS) creation; principal critical functions (for WWER reactors); the SPDS operating conditions; the structure of the crisis centre information system; three levels of the NPP safety control; the current status of symptom-oriented emergency manuals and the SPDS role.

15554 (IAEA-IWG-NPPCI–95/1, pp. 129-148) **Instrumentation and control activities at the Electric Power Research Institute to support operator support systems.** Naser, J. (Electric Power Research Inst., Palo Alto, CA (United States)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

Most nuclear power plants in the United States continue to operate with analog instrumentation and control (I and C) technology designed 20 to 40 years ago. This equipment is approaching or exceeding its life expectancy, resulting in increasing maintenance efforts to sustain system performance. Decreasing availability of replacement parts and the accelerating deterioration of the infrastructure of manufacturers that support analog technology exacerbate obsolescence problems and resultant operation and maintenance (O and M) cost increases. Modern digital technology holds a significant potential to improve the safety, cost-effectiveness, productivity, and, therefore, competitiveness of nuclear power plants. Operator support systems provide the tools to help achieve this potential. Reliable, integrated information is a critical element for protecting the utility's capital investment and increasing availability, reliability, and productivity. Integrated operator support systems with integrated information can perform more effectively to increase productivity, to enhance safety, and to reduce O and M costs. The plant communications and computing architecture is the infrastructure needed to allow the implementation of I and C systems and associated operator support systems in an integrated manner. Current technology for distributed digital systems, plant process computers, and plant communications and computing networks support the integration of systems and information. (author). 16 refs.

15555 (IAEA-IWG-NPPCI–95/1, pp. 149-207) **Determine what requirements should be established for verification and validation of OSS software, and which techniques are available to improve V and V. Task 4.5.3.** International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

Verification and validation (V and V) is the process to ensure that a system is designed according to its requirements and to confirm that the system actually performs the required functions completely and reliably. V and V methodology and guidelines are fundamental to all digital implementations in nuclear plants. The objectives of R and D projects in the area of V and V are to: Evaluate V and V standards are methods for applicability in enhancing operator support systems at nuclear power plants; Develop new V and V standards and methods when those existing do not entirely meet the needs of these new applications; ensure that V and V of operator support systems is sufficient to meet design requirements and fully demonstrate that operator support systems function as intended; provide communication of V and V methods and requirements so that they are properly utilized; provide V and V methods and tools which will allow the process to be performed consistently

and efficiently, and which enhance acceptance from users, management, vendors, and regulators. Refs.

15556 (IAEA-IWG-NPPCI–95/1, pp. 209-215) **Design of operator support systems for Argentine Nuclear Power Plants.** Goldstein, M. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)); Palamidessi, H.A. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The commitment of the group working on the OSS developed in CNEA (Argentine Atomic Energy Commission) is centred in the following items of the Coordinated Research Program: (1) Item 4.1.2: Survey of existing operator support systems and the experience with them; (2) Item 4.1.3: Survey of anticipated functional requirements and experience; (3) Item 4.2.2: Evaluation of functions and identification of where OSS can support those functions in a productive way; (4) Item 4.3.3: Develop guidance on how the end user should be involved in the development of OSS. The survey includes a summary of the national activities related with the area, beyond the responsibilities of the CRP group. 6 refs.

15557 (IAEA-IWG-NPPCI–95/1, pp. 217-223) **National report from Czech Republic.** Kurka, J. (EGU Prague plc., Prague (Czech Republic). Dept. of Automated Systems). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The project of the Temelin NPP instrumentation and control systems and reactor core fuel replacement is outlined. Current status in development of operator support system and the activities in EGU Prague, plc. under CRP contract with this regard is discussed.

15558 (IAEA-IWG-NPPCI–95/1, pp. 225-232) **1994 report on Task 4.3.1 investigate how training should be planned to ensure efficient utilisation or OSS. Task 4.3.2 evaluate how the introduction of OSS influences requirements to the basic education of the operator.** International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

According to the experience coming from countries where new concepts of nuclear power plants control rooms equipped with integrated system of OSSs have recently been largely tested in experimental centres equipped with powerful real-time plant simulators (e.g. NORWAY - Halden project; Japan) a training in use of the OSS is important, so that the operator can use it in the right situation and in right manner. Experiments, in which mostly experienced active control room operators from operating NPPs took part showed as well, that both the requirements for additional basic education of operators and the planning of training is influenced by a number of different factors like complexity of system structure and interface, system function, capabilities of training centres, operators background, experience and age and others. 6 refs.

15559 (IAEA-IWG-NPPCI–95/1, pp. 234-250) **A method for analysis of nuclear power plant operators' decision making in simulated disturbance situations.** International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

An analysis method has been developed for analysis of nuclear power plant operators' decision making in simulated disturbance situations. The aim of the analysis is to investigate operators' orientation which is expected to manifest itself as collective strategies in utilization of resources of decision making. Resources analyzed here are different information sources and, in addition, collaborative resources like communication and participation. The cognitive approach on the basis of the method considers decision making as collective construction of common interpretation of available information. Utilization of information is evaluated with respect to operative context. This is made with help of conceptualization of the disturbance situation from the decision making point of view and by construction of operative reference for activity. The latter means conceptualization of the situation from the safety point of view and also consideration of other boundary constraints of decision making, i.e. economical and technical aspects. The analysis method is intended to be used in routine simulator training in nuclear power plants. By virtue of its contextual and dynamical approach it makes the developing nature of activity visible. Cumulation and distribution of knowledge of decision making as developing activity, controlled by orientation and boundary constraints of process control, is expected to improve operational culture of a plant organization. (author). 2 refs, 1 fig.

15560 (IAEA-IWG-NPPCI–95/1, pp. 251-259) **Formal methods in design and verification of functional specifications.** Vaelisuo, H. (VTT Automation (Finland)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

It is claimed that formal methods should be applied already when specifying the functioning of the control/monitoring system, i.e. when planning how to implement the desired operation of the plant. Formal methods are seen as a way to mechanize and thus automate part of the planning. All mathematical methods which can be applied on related problem solving should be considered as formal methods. Because formal methods can only support the designer, not replace him/her, they must be integrated into a design support tool. Such a tool must also aid the designer in getting the correct conception of the plant and its behaviour. The use of a hypothetic design support tool is illustrated to clarify the requirements such a tool should fulfill. (author). 3 refs, 5 figs.

15561 (IAEA-IWG-NPPCI–95/1, pp. 261-270) **Strategy generation in accident management support.** Sirola, M. (Technical Research Centre of Finland (Finland)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

An increased interest for research in the field of Accident Management can be noted. Several international programmes have been started in order to be able to understand the basic physical and chemical phenomena in accident conditions. A feasibility study has shown that it would be possible to design and develop a computerized support system for plant staff in accident situations. To achieve this goal the Halden Project has initiated a research programme on Computerized Accident Management Support (CAMS project). The aim is to utilize the capabilities of computerized tools to support the plant staff during the various accident stages. The

system will include identification of the accident state, assessment of the future development of the accident and planning of accident mitigation strategies. A prototype is developed to support operators and the Technical Support Centre in decision making during serious accident in nuclear power plants. A rule based system has been built to take care of the strategy generation. This system assists plant personnel in planning control proposals and mitigation strategies from normal operation to severe accident conditions. The ideal of a safety objective tree and knowledge from the emergency procedures have been used. Future prediction requires good state identification of the plant status and some knowledge about the history of some critical variables. The information needs to be validated as well. Accurate calculations in simulators and a large database including all important information form the plant will help the strategy planning. (author). 12 refs, 2 figs.

15562 (IAEA-IWG-NPPCI–95/1, pp. 271-287) **Fault tree and failure mode and effects analysis of a digital safety function.** Maskuniitty, M. (VTT Automation, Industrial Automation (Finland)); Pulkkinen, U. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The principles of fault tree and failure mode and effects analysis (FMEA) for the analysis of digital safety functions of nuclear power plants are discussed. Based on experiences from a case study, a proposal for a full scale analysis is presented. The feasibility and applicability the above mentioned reliability engineering methods are discussed. (author). 13 refs, 1 fig., 2 tabs.

15563 (IAEA-IWG-NPPCI–95/1, pp. 289-297) **Validation of programmable industrial automation systems for safety critical applications in NPP's; dynamic testing.** Haapanen, P. (Technical Research Centre of Finland, Espoo (Finland)); Korhonen, J. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The safety assessment of programmable automation systems cannot be totally be based on conventional probabilistic methods because of the difficulties in quantification of the reliability of the software as well as the hardware. Additional means shall therefore be used to gain more confidence on the system dependability. One central confidence building measure is the independent dynamic testing of the completed system. An automated test harness is needed to run the required large amount of test cases in a restricted time span. This paper describes a prototype dynamic testing harness for programmable digital systems developed at VTT. (author). 12 refs, 2 figs, 2 tabs.

15564 (IAEA-IWG-NPPCI–95/1, pp. 299-308) **Experience with the upgraded VERONA-u. A WWER-440 core monitoring system.** Lux, I. (KFKI Atomic Energy Research Inst., Budapest (Hungary). Applied Reactor Physics Dept.); Vegh, J.; Adorjan, F.; Buerger, L. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

Purpose of upgrading, core surveillance objectives, main features of the VERONA-u, as well as operational experience of the system are discussed.

15565 (IAEA-IWG-NPPCI–95/1, pp. 309-315) **Develop guidance on how the end user should be involved in the development of OSS. Reflection on Task 4.3.3.** Lux, I. (KFKI Atomic Energy Research Inst., Budapest (Hungary)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

On the occasion of the 1993 CRP Meeting in Budapest the working group has determined the main lines of the elaboration of the task objective. The present Reflections are meant to give a somewhat deeper presentation of the thoughts put forward by the working group and also to propose a basis for further discussions before the final formulation of the guidance in question. 6 refs, 2 tabs.

15566 (IAEA-IWG-NPPCI–95/1, pp. 317-341) **1994 report on Tasks 4.3.1 and 4.3.2: Survey of anticipated requirements and qualification requirements for OSS.** Silvani, V. International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

This is a preliminary report summarizing some topics related to the survey on functional and qualification requirements of Operator Support Systems (OSS's) in NPP's. This document has been prepared on the basis of the information presented in the previous meetings of this CRP working group. Additional information are expected when the answers to the working group questionnaire will be available. Functionalities examined are those referring to system functions and user's needs; technology trends are also considered. For practical purposes this document is divided in the followings: Summary of major OSS requirements and related problems as derived from the existing literature; appendix 1 reporting a summary of major functions performed by the OSS's presently in operation or under development in laboratories; appendix 2 reporting the list of standards for critical software. 18 refs, tabs.

15567 (IAEA-IWG-NPPCI–95/1, pp. 343-348) **Contribution to the Task 4.3.1 investigate how training should be planned to ensure efficient utilization of OSS. Task 4.3.2 evaluate how the introduction of OSS influences requirements to the basic education of the operator.** Balducelli, C. (ENEA, Rome (Italy)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994.* 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The introduction of computerized supports to improve efficiency in the activity of an intelligent agent (the operator in NPP case) increases the agent training demand. In fact also the informatic support can be viewed as an "artificial agent", more or less "active" depending on its internal degree of autonomy: the human agent needs to be trained to "coordinate" his behaviour with the behaviour of the artificial agent. The basic idea of this work is that a more safe, complete and integrated OSS could be a system (an artificial agent) that gives support to the human agent not only during the plant real operations, but also during the different phases of operator education and training for normal and emergency situations management. 7 refs, 2 figs.

15568 (IAEA-IWG-NPPCI–95/1, pp. 349-369) **IAEA CRP on operator support systems in nuclear power plants. 1994**

national activities and task report (Task 4.2.2). Fujita, Y. (Mitsubishi Atomic Power Industries, Inc., Nishika, Yokohama (Japan)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

National activities in creating operator support systems in nuclear power plants and task report (Task 4.2.2) are presented.

15569 (IAEA-IWG-NPPCI–95/1, pp. 371-375) **National report by Netherlands Energy Research Foundation (ECN).** Jehee, J.N.T. (Netherlands Energy Research Foundation (ECN), Petten (Netherlands)). International Atomic Energy Agency, Vienna (Austria). International Working Group on Nuclear Power Plant Control and Instrumentation. 1995. (CONF-9410339–: Research co-ordination meeting on operator support systems in nuclear power plants, Rome (Italy), 10-14 Oct 1994). In *Co-ordinated research programme on operator support systems in nuclear power plants. Working material. Report of a research co-ordinated meeting held in Rome, 10-14 October 1994*. 375p. Order Number DE95627980. Source: OSTI; NTIS (US Sales Only); INIS.

The following projects at ECN related to the IAEA Coordinated Research Program on 'Operator Support Systems in NPP' are described: the Accident Management Support project partially funded by the European Union; modification of the IPSO display at the Borssele NPP.

15570 (INIS-JP–027, pp. 121-130) **Intelligent control system Cellular Robotics Approach to Nuclear Plant control and maintenance.** Fukuda, Toshio (Nagoya Univ. (Japan). School of Engineering); Sekiyama, Kousuke; Xue Guoqing; Ueyama, Tsuyoshi. Japan Atomic Energy Research Inst., Tokyo (Japan). 1994. 431p. (CONF-9405245–: AIR'94: specialists' meeting on application of artificial intelligence and robotics of nuclear plants, Tokai (Japan), 30 May - 1 jun 1994). In *Proceedings of specialists' meeting on application of artificial intelligence and robotics to nuclear plants*. Order Number DE95709894. Source: OSTI; NTIS; INIS.

This paper presents the concept of Cellular Robotic System (CEBOT) and describe the strategy of a distributed sensing, control and planning as a Cellular Robotics Approach to the Nuclear Plant control and maintenance. Decentralized System is effective in large plant and The CEBOT possesses desirable features for realization of Nuclear Plant control and maintenance because of its flexibility and adaptability. Also, as related on going research work, self-organizing manipulator and communication issues are mentioned. (author).

15571 (NUREG/CR–6046) **Alertness, performance and off-duty sleep on 8-hour and 12-hour night shifts In a simulated continuous operations control room setting.** Baker, T.L. (Institute for Circadian Physiology, Boston, MA (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Institute for Circadian Physiology, Boston, MA (United States). Apr 1995. 142p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

A growing number of nuclear power plants in the United States have adopted routine 12-hr shift schedules. Because of the potential impact that extended work shifts could have on safe and efficient power plant operation, the U.S. Nuclear Regulatory Commission funded research on 8-hr and 12-hr shifts at the Human Alertness Research Center (HARC) in Boston, Massachusetts. This report describes the research undertaken: a study of simulated 8-hr and 12-hr work shifts that compares alertness, speed, and accuracy at responding to simulator alarms, and relative cognitive performance, self-rated mood and vigor, and sleep-wake patterns of 8-hr versus 12-hr shift workers.

15572 (NUREG/CR–6316-Vol.1) **Guidelines for the verification and validation of expert system software and conventional software: Project summary. Volume 1.** Mirsky, S.M. (Science Applications International Corp., McLean, VA (United States)); Hayes, J.E.; Miller, L.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 158p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.1). Source: OSTI; NTIS; GPO; INIS.

This eight-volume report presents guidelines for performing verification and validation (V&V) on Artificial Intelligence (AI) systems with nuclear applications. The guidelines have much broader application than just expert systems; they are also applicable to object-oriented programming systems, rule-based systems, frame-based systems, model-based systems, neural nets, genetic algorithms, and conventional software systems. This is because many of the components of AI systems are implemented in conventional procedural programming languages, so there is no real distinction. The report examines the state of the art in verifying and validating expert systems. V&V methods traditionally applied to conventional software systems are evaluated for their applicability to expert systems. One hundred fifty-three conventional techniques are identified and evaluated. These methods are found to be useful for at least some of the components of expert systems, frame-based systems, and object-oriented systems. A taxonomy of 52 defect types and their delectability by the 153 methods is presented. With specific regard to expert systems, conventional V&V methods were found to apply well to all the components of the expert system with the exception of the knowledge base. The knowledge base requires extension of the existing methods. Several innovative static verification and validation methods for expert systems have been identified and are described here, including a method for checking the knowledge base "semantics" and a method for generating validation scenarios. Evaluation of some of these methods was performed both analytically and experimentally. A V&V methodology for expert systems is presented based on three factors: (1) a system's judged need for V&V (based in turn on its complexity and degree of required integrity); (2) the life-cycle phase; and (3) the system component being tested.

15573 (NUREG/CR–6316-Vol.2) **Guidelines for the verification and validation of expert system software and conventional software: Survey and assessment of conventional software verification and validation methods. Volume 2.** Mirsky, S.M. (Science Applications International Corp., McLean, VA (United States)); Groundwater, E.H.; Hayes, J.E.; Miller, L.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 176p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.2). Source: OSTI; NTIS; GPO; INIS.

By means of a literature survey, a comprehensive set of methods was identified for the verification and validation of conventional software. The 153 methods so identified were classified according to their appropriateness for various phases of a developmental life-cycle – requirements, design, and implementation; the last category was subdivided into two, static testing and dynamic testing methods. The methods were then characterized in terms of eight rating factors, four concerning ease-of-use of the methods and four concerning the methods' power to detect defects. Based on these factors, two measurements were developed to permit quantitative comparisons among methods, a Cost-Benefit metric and an Effectiveness Metric. The Effectiveness Metric was further refined to provide three different estimates for each method, depending on three classes of needed stringency of V&V (determined by ratings of a system's complexity and required-integrity). Methods were then rank-ordered for each of the three classes by terms of their overall cost-benefits and effectiveness. The applicability was then assessed of each for the identified components of knowledge-based and expert systems, as well as the system as a whole.

15574 (NUREG/CR–6316-Vol.3) **Guidelines for the verification and validation of expert system software and conventional**

software: Survey and documentation of expert system verification and validation methodologies. Volume 3. Groundwater, E.H. (Science Applications International Corp., McLean, VA (United States)); Miller, L.A.; Mirsky, S.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 100p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.3). Source: OSTI; NTIS; GPO; INIS.

This report is the third volume in the final report for the Expert System Verification and Validation (V&V) project which was jointly sponsored by the Nuclear Regulatory Commission and the Electric Power Research Institute. The ultimate objective is the formulation of guidelines for the V&V of expert systems for use in nuclear power applications. The purpose of this activity was to survey and document techniques presently in use for expert system V&V. The survey effort included an extensive telephone interviewing program, site visits, and a thorough bibliographic search and compilation. The major finding was that V&V of expert systems is not nearly as established or prevalent as V&V of conventional software systems. When V&V was used for expert systems, it was almost always at the system validation stage after full implementation and integration usually employing the non-systematic dynamic method of "ad hoc testing." There were few examples of employing V&V in the early phases of development and only weak sporadic mention of the possibilities in the literature. There is, however, a very active research area concerning the development of methods and tools to detect problems with, particularly, rule-based expert systems. Four such static-testing methods were identified which were not discovered in a comprehensive review of conventional V&V methods in an earlier task.

15575 (NUREG/CR–6316-Vol.4) **Guidelines for the verification and validation of expert system software and conventional software: Evaluation of knowledge base certification methods. Volume 4.** Miller, L.A. (Science Applications International Corp., McLean, VA (United States)); Hayes, J.E.; Mirsky, S.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 122p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.4). Source: OSTI; NTIS; GPO; INIS.

This report presents the results of the Knowledge Base Certification activity of the expert systems verification and validation (V&V) guideline development project which is jointly funded by the US Nuclear Regulatory Commission and the Electric Power Research Institute. The ultimate objective is the formulation of guidelines for the V&V of expert systems for use in nuclear power applications. This activity is concerned with the development and testing of various methods for assuring the quality of knowledge bases. The testing procedure used was that of behavioral experiment, the first known such evaluation of any type of V&V activity. The value of such experimentation is its capability to provide empirical evidence for – or against – the effectiveness of plausible methods in helping people find problems in knowledge bases. The three-day experiment included 20 participants from three nuclear utilities, the Nuclear Regulatory Commission's Technical training Center, the University of Maryland, EG&G Idaho, and SAIC. The study used two real nuclear expert systems: a boiling water reactor emergency operating procedures tracking system and a pressurized water reactor safety assessment systems. Ten participants were assigned to each of the expert systems. All participants were trained in and then used a sequence of four different V&V methods selected as being the best and most appropriate for study on the basis of prior evaluation activities. These methods either involved the analysis and tracing of requirements to elements in the knowledge base (requirements grouping and requirements tracing) or else involved direct inspection of the knowledge base for various kinds of errors. Half of the subjects within each system group used the best manual variant of the V&V methods (the control group), while the other half were supported by the results of applying real or simulated automated tools to the knowledge bases (the experimental group).

15576 (NUREG/CR–6316-Vol.5) **Guidelines for the verification and validation of expert system software and conventional software: Rationale and description of V&V guideline packages and procedures. Volume 5.** Mirsky, S.M. (Science Applications International Corp., McLean, VA (United States)); Hayes, J.E.; Miller, L.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 99p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.5). Source: OSTI; NTIS; GPO; INIS.

This report is the fifth volume in a series of reports describing the results of the Expert System Verification C, and Validation (V&V) project which is jointly funded by the U.S. Nuclear Regulatory Commission and the Electric Power Research Institute toward the objective of formulating Guidelines for the V&V of expert systems for use in nuclear power applications. This report provides the rationale for and description of those guidelines. The actual guidelines themselves are presented in Volume 7, "User's Manual." Three factors determine what V&V is needed: (1) the stage of the development life cycle (requirements, design, or implementation); (2) whether the overall system or a specialized component needs to be tested (knowledge base component, inference engine or other highly reusable element, or a component involving conventional software); and (3) the stringency of V&V that is needed (as judged from an assessment of the system's complexity and the requirement for its integrity to form three Classes). A V&V Guideline package is provided for each of the combinations of these three variables. The package specifies the V&V methods recommended and the order in which they should be administered, the assurances each method provides, the qualifications needed by the V&V team to employ each particular method, the degree to which the methods should be applied, the performance measures that should be taken, and the decision criteria for accepting, conditionally accepting, or rejecting an evaluated system. In addition to the Guideline packages, highly detailed step-by-step procedures are provided for 11 of the more important methods, to ensure that they can be implemented correctly. The Guidelines can apply to conventional procedural software systems as well as all kinds of AI systems.

15577 (NUREG/CR–6316-Vol.6) **Guidelines for the verification and validation of expert system software and conventional software: Validation scenarios. Volume 6.** Mirsky, S.M. (Science Applications International Corp., McLean, VA (United States)); Hayes, J.E.; Miller, L.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 46p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.6). Source: OSTI; NTIS; GPO; INIS.

This report is the sixth volume in a series of reports describing the results of the Expert System Verification and Validation (V&V) project which is jointly funded by the US Nuclear Regulatory Commission and the Electric Power Research Institute. The ultimate objective is the formulation of guidelines for the V&V of expert systems for use in nuclear power applications. This activity was concerned with the development of a methodology for selecting validation scenarios and subsequently applying it to two expert systems used for nuclear utility applications. Validation scenarios were defined and classified into five categories: PLANT, TEST, BASICS, CODE, and LICENSING. A sixth type, REGRESSION, is a composite of the others and refers to the practice of using trusted scenarios to ensure that modifications to software did not change unmodified functions. Rationale was developed for preferring scenarios selected from the categories in the order listed and for determining under what conditions to select scenarios from other types. A procedure incorporating all of the recommendations was

developed as a generalized method for generating validation scenarios. The procedure was subsequently applied to two expert systems used in the nuclear industry and was found to be effective, given that an experienced nuclear engineer made the final scenario selections. A method for generating scenarios directly from the knowledge base component was suggested.

15578 (NUREG/CR–6316-Vol.7) **Guidelines for the verification and validation of expert system software and conventional software: User's manual. Volume 7.** Mirsky, S.M. (Science Applications International Corp., McLean, VA (United States)); Hayes, J.E.; Miller, L.A. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 230p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95-1028-Vol.7). Source: OSTI; NTIS; GPO; INIS.

This report provides a step-by-step guide, or user manual, for personnel responsible for the planning and execution of the verification and validation (V&V), and developmental testing, of expert systems, conventional software systems, and various other types of artificial intelligence systems. While the guide was developed primarily for applications in the utility industry, it applies well to all industries. The user manual has three sections. In Section 1 the user assesses the stringency of V&V needed for the system under consideration, identifies the development stage the system is in, and identifies the component(s) of the system to be tested next. These three pieces of information determine which Guideline Package of V&V methods is most appropriate for those conditions. The V&V Guideline Packages are provided in Section 2. Each package consists of an ordered set of V&V techniques to be applied to the system, guides on choosing the review/evaluation team, measurement criteria, and references to a book or report which describes the application of the method. Section 3 presents details of 11 of the most important (or least well-explained in the literature) methods to assist the user in applying these techniques accurately.

15579 (NUREG/CR–6316-Vol.8) **Guidelines for the verification and validation of expert system software and conventional software: Bibliography. Volume 8.** Miller, L.A. (Science Applications International Corp., McLean, VA (United States)); Hayes, J.E.; Mirsky, S.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Technology; Electric Power Research Inst., Palo Alto, CA (United States). Nuclear Power Div.; Science Applications International Corp., McLean, VA (United States). Mar 1995. 49p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). (SAIC–95/1028-Vol.8). Source: OSTI; NTIS; GPO; INIS.

This volume contains all of the technical references found in Volumes 1-7 concerning the development of guidelines for the verification and validation of expert systems, knowledge-based systems, other AI systems, object-oriented systems, and conventional systems.

15580 (STUK-YTO-TR–52) **Diversity and testing requirements of programmable automation systems.** Haapanen, P.; Maskuniitty, M. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Apr 1993. 58p. (In Finnish). Order Number DE95627982. Source: OSTI; NTIS; INIS.

In the report programmable digital operation and safety automation systems for nuclear power plants are discussed. The programmable systems deviate by their properties and behaviour from the conventional non-programmable systems in such extent, that their verification and validation for safety critical applications requires new methods and practices. The safety assessment can not be based on conventional probabilistic methods due to the difficulties in the quantification of the reliability of the software and hardware. A safety critical programmable system shall include diverse redundant parts so that no residual program fault can not cause the failure of the intended function of the system. Although complete testing of a programmable system is impossible, different tests have a central role in the production and validation process of the system. Diversity is important also in confidence building measures for the implemented system. Independent analysis and testing of the system should use different methods and tools from those used in the production and validation process by the system vendor. Use of diversity and testing are concluded to be central issues in producing safe programmable system and in proving them to be safe enough. By combining functional and programming diversity in a suitable way one can produce a system that is safe enough without having a non-programmable back-up system. (48 refs., 10 figs., 2 tabs.).

2205 Environmental Aspects

Refer also to citation(s) 15144, 15453, 16497, 16528, 17340

2206 Research, Test, Training, Production, Irradiation, Materials Testing Reactors

Refer also to citation(s) 14921, 14923, 14924, 14925, 14926, 14927, 14928, 14929, 14930, 14931, 14932, 15003, 15385, 15395, 15413, 15460, 15481, 15595, 15596, 15597, 15612, 16348, 16351, 16352

15581 (CONF-941144–114) **Neutron scattering at the high flux isotope reactor at Oak Ridge National Laboratory.** Yethiraj, M.; Fernandez-Baca, J.A. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95008841. Source: OSTI; NTIS; INIS; GPO Dep.

Since its beginnings in Oak Ridge and Argonne in the late 1940's, neutron scattering has been established as the premier tool to study matter in its various states. Since the thermal neutron wavelength is of the same order of magnitude as typical atomic spacings and because they have comparable energies to those of atomic excitations in solids, both structure and dynamics of matter can be studied via neutron scattering. The High Flux Isotope Reactor (HFIR) provides an intense source of neutrons with which to carry out these measurements. This paper summarizes the available neutron scattering facilities at the HFIR.

15582 (HW–22572) **Technical activities report research and development & 234-5 metallurgy groups metallurgy - pile technology unit, October 1951.** Schalliol, W.L.; Wick, O.J. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 1 Nov 1951. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009449. Source: OSTI; NTIS; GPO Dep.

This is a technical progress report for the Research and Development, and 234-5 Metallurgy Groups of the metallurgy-pile technology unit for the period Oct 1951. Numerous reports are attached under the general areas: P-10 alloy development; uranium metallurgy; metallurgy of Hanford structural materials; radiometallurgy, facility development; plutonium metallurgy program; canning development; plant service work; 234-5 metallurgy group, plutonium metallurgy program.

15583 (HW–62273-Rev.2) **Graphite burnout, interim report on IP-25-A (PT-105-532-E).** Ryan, B.A.; Halas, D.R. de. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Mar 1960. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009507. Source: OSTI; NTIS; GPO Dep.

Graphite reacts with such gases as CO_2, O_2, or water vapor to form gaseous oxides of carbon. In the case of CO_2-graphite interaction, the reaction rate is not significant until about 550 C. Water oxidizes graphite, very roughly, three times faster than CO_2. Air will oxidize graphite appreciably at temperatures below 500 C. Graphite removal from Hanford reactors is very important, since graphite is used both as a structural support and a moderator for neutrons. Griggs has shown that small graphite samples oxidized to 10 per cent weight loss had only about one-half their original compression strength. Hence, the longevity of the reactors depends to a great extent on maintaining a low graphite oxidation

rate. A means of monitoring the extent of graphite loss, i. e., the burnout rate, is necessary to establish future reactor operational standards. Presently, weighed samples of reactor grade graphite are placed along the length of an empty process channel in each reactor. Thus, a sample is exposed to the reactor's ambient conditions of power level, moderator temperature, and gas composition. This program was initiated in the vicinity of June, 1953 by Woodley. This report presents data on graphite burnout obtained from in-reactor experiments authorized under IP-25-A (PT-105-532-E) from August, 1957 to January, 1960. Burnout rates are obtained by a direct measurement of the weight loss of control graphite samples exposed to the reactor atmosphere.

15584 (JHP-Suppl–15, pp. 188-190) **RI beam project at KUR.** Kawase, Yoichi (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (In Japanese). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. KUR REACTOR/ion beams; RADIOISOTOPES/ion beams; RESEARCH PROGRAMS; RADIOISOTOPES; SEPARATION EQUIPMENT; POSITRON BEAMS; LABORATORY EQUIPMENT; REACTOR EXPERIMENTAL FACILITIES; INSTALLATION

15585 (JINR-E–3-94-128, pp. 9-10) **Rapidity pulsed Triga reactor: an intense source for neutron scattering experiments.** Whittmore, W.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TRIGA TYPE REACTORS/neutron diffraction; TRIGA TYPE REACTORS/neutron sources; FUEL ELEMENTS; MATRIX MATERIALS; NEUTRON FLUX; POWER RANGE; PULSED NEUTRON TECHNIQUES

15586 (JINR-E–3-94-128, pp. 25) **Ultracold neutron generator at the BIGR reactor (ARZAMAS-16).** Voinov, A.M.; Kuvshinov, M.I.; Smirnov, I.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PULSED REACTORS/ultracold neutrons; FEASIBILITY STUDIES; FLUX DENSITY; NEUTRON FLUX; NEUTRON GUIDES

15587 (JINR-E–3-94-128, pp. 26) **Neutron optics facilities at IBR-2 high flux pulsed reactor.** Korneev, D.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. IBR-2 REACTOR/neutron reflectors; IBR-2 REACTOR/neutron spectrometers; NEUTRON BEAMS; NEUTRON CHOPPERS; POLARIZED BEAMS

15588 (JINR-E–3-94-128, pp. 27) **The university of TEXAS cold neutron source.** Wehring, B.W.; Unlu, K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TRIGA-2 REACTOR/cold neutrons; MESITYLENE; MODERATORS; NEUTRON GUIDES; PERFORMANCE TESTING

15589 (JINR-E–3-94-128, pp. 29) **Experimental study of neutronic performance of the IBR-2 reactor solid methane moderator.** Pepyolyshev, Yu.N.; Tulaev, A.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. IBR-2 REACTOR/thermal neutrons; METHANE; MODERATORS; NEUTRON FLUX; NEUTRON SPECTRA; OPERATION; WATER

15590 (JINR-E–3-94-128, pp. 30) **Solid methane moderator at the IBR-2: test operation at 2 MW.** Belyakov, A.A.; Yerminov, V.G.; Melikov, V.V.; Shabalin, E.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. IBR-2 REACTOR/moderators; COLD NEUTRONS; HEAT FLUX; MODERATORS; METHANE; PERFORMANCE TESTING; POWER RANGE 01-10 MW; RADIATION DOSES

15591 (JINR-E–10-92-243) **A pattern recognition approach to condition-based plant maintenance.** Pepyolyshev, Y.N.; Dzwinel, W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1992. 14p. Order Number DE95626906. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Technical Commitee Meeting on Safety and Reliability Improvement Through Optimized Plant Maintenance, Vienna, Austria, 22-24 June 1992.

The condition-based maintenance is initiated as a result of a predetermained type of criteria which measure equipment degradation. In order to power plant safety and reliability improvment the authors propose to enrich the widely used threshold criteria by the new one resulting from cases, the type of preventive restoration actions the authors propose to connect additionally all of them into single and clear logical system. The system application for condition-based maintenance of the IBR-2 (JINR, Dubna) pulsed reactor is exemplified. 8 refs.; 4 figs.

15592 (LA-UR–95-951) **The use of deterministic codes for "separating the wheat from the chaff" in benchmark models and calculations.** O'Dell, R.D. Los Alamos National Lab., NM (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505195–2: Nuclear criticality technology and safety project (NCTSP) annual meeting, San Diego, CA (United States), 17 May 1995). Order Number DE95009421. Source: OSTI; NTIS; INIS; GPO Dep.

An important effort in the field of nuclear criticality safety is the establishing and modeling of a set of benchmark critical (or near critical) experiments and the use of these benchmark experiment models to validate and verify computer codes and cross sections. For the most part Monte Carlo codes such as MCNP and KENO.VA have emerged as the codes of choice in the U.S. Since Monte Carlo codes generally have the capability of modeling complex geometries in great detail there is a tendency to focus attention on modeling an experiment in very great detail. Indeed, it is the author's observation that so much effort is expended trying to exactly model unimportant details (the 'chaff') that many of the truly significant features and characteristics (the 'wheat') of the experiment can be lost in the shuffle. An obvious question now arises. How does one determine what is 'wheat' and what is 'chaff'? This presentation will focus on the use of deterministic, or, more specifically, discrete-ordinates codes for performing sensitivity calculations in determining which details are important and which are not. The principal advantage of discrete-ordinates codes is that they can quite precisely determine the effect on k_{eff} associated with distinct details of an experiment such as impurities, external structure, conflicting or missing information, etc. Three different examples are used to demonstrate the value of using discrete-ordinates codes for separating the wheat from the chaff. It is also shown that, for all practical purposes, Monte Carlo codes are essentially unsuited for determining small effects on k_{eff}.

15593 (WHC-SD-SNF-DRR–002-Vol.1) **Design review report for the 105 K-East Basin dose reduction concept. Volume 1.** Dearing, J.I. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010134. Source: OSTI; NTIS; INIS; GPO Dep.

Radiological surveys in the 105 K-East Fuel Storage Basin show average dose rates of 4 to 50 mrem/hr. A major source of the dose is the radionuclides that have been absorbed into the concrete wall of the basin. This reports documents the design review of the concept for reducing the dose from the walls. Volume 1 comprises the Design Review Report and Volume 2 comprises the Design Review Package.

15594 (WHC-SD-TP-ANAL–002) **CNS 1-13G Cask lid support frame structural analysis.** Crow, S.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010144. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the structural analysis of the support frame for the Chem-Nuclear Systems (CNS) 1-13G Cask. The support frame will catch on underwater supports while the cask is being lowered into the pit, aiding in the removal of the cask lid in the load out chute in the K-Basins.

2209 Reactor Safety

Refer also to citation(s) 15384, 15572, 15573, 15574, 15575, 15576, 15577, 15578, 15579, 15682, 17340

15595 (ANL/TD/RP–85215) **Status report on the Experimental Boiling Water Reactor (EBWR) Decontamination and Decommissioning (D&D) Project.** Sears, L. (ALARON Corp., Cayce, SC (United States)); Garlock, G.; Mencarelli, R.; Fellhauer, C. Argonne National Lab., IL (United States); ALARON Corp., Cayce, SC (United States). 15 Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009911. Source: OSTI; NTIS; INIS; GPO Dep.

ALARON Corporation is under contract, to Argonne National Laboratory - East (ANL-E), to complete the decontamination and decommissioning of the Experimental Boiling Water Reactor (EBWR). The project, begun, in 1986 by ANL-E personnel, is projected to be completed by the end of 1994. The final phase of work was awarded to ALARON in December 1993 with the scope of work including the disassembly and removal of all remaining reactor internals, the reactor vessel, the lead bio-shield, the core liner, and the activated portion of the concrete bio-shield. This paper discusses the work undertaken beginning in January 1994 and continuing through July 1994. During this period the required pre-mobilization documentation was prepared and approved, mobilization was completed, and the reactor internals, reactor vessel, lead bio-shield and core liner were removed. The paper will compare the planned schedule to the actual schedule, discuss problems encountered, review volume reduction techniques and health and safety issues including radiological aspects of the project.

15596 (BNL–52456) **Level 1 Tornado PRA for the High Flux Beam Reactor.** Bozoki, G.E.; Conrad, C.S. Brookhaven National Lab., Upton, NY (United States). May 1994. 304p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95009162. Source: OSTI; NTIS; GPO Dep.

This report describes a risk analysis primarily directed at providing an estimate for the frequency of tornado induced damage to the core of the High Flux Beam Reactor (HFBR), and thus it constitutes a Level 1 Probabilistic Risk Assessment (PRA) covering tornado induced accident sequences. The basic methodology of the risk analysis was to develop a "tornado specific" plant logic model that integrates the internal random hardware failures with failures caused externally by the tornado strike and includes operator errors worsened by the tornado modified environment. The tornado hazard frequency, as well as earlier prepared structural and equipment fragility data, were used as input data to the model. To keep modeling/calculational complexity as simple as reasonable a "bounding" type, slightly conservative, approach was applied. By a thorough screening process a single dominant initiating event was selected as a representative initiator, defined as: "Tornado Induced Loss of Offsite Power." The frequency of this initiator was determined to be 6.37E-5/year. The safety response of the HFBR facility resulted in a total Conditional Core Damage Probability of .621. Thus, the point estimate of the HFBR's Tornado Induced Core Damage Frequency (CDF) was found to be: $(CDF)_{Tornado}$ = 3.96E-5/year. This value represents only 7.8% of the internal CDF and thus is considered to be a small contribution to the overall facility risk expressed in terms of total Core Damage Frequency. In addition to providing the estimate of $(CDF)_{Tornado}$, the report documents, the relative importance of various tornado induced system, component, and operator failures that contribute most to $(CDF)_{Tornado}$.

15597 (CONF-950601–8) **Using Level 1 PRA for enhanced safety of the Advanced Neutron Source Reactor.** Ramsey, C.T.; Linn, M.A. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Annual meeting of the American Nuclear Society; Philadelphia, PA (United States); 25-29 Jun 1995. Order Number DE95009180. Source: OSTI; NTIS; INIS; GPO Dep.

The Phase 1 Level I probabilistic risk assessment (PRA) of the Advanced Neutron Source Reactor (ANS) has been completed as part of the conceptual design phase of this proposed research facility. Since project inception, PRA and reliability concepts have been an integral part of the design evolution, contributing to many of the safety features in the current design. The Level I PRA has been used to evaluate the internal events core damage frequency against project goals, to identify systems important to safety and availability, and will continue to guide and provide support to accident analysis, both severe and nonsevere. The results also reflect the risk value of defense-in-depth safety features in reducing the likelihood of core damage.

15598 (HHS-CFR-B–10) **Medical and psychological aspects of crisis management during a nuclear accident.** Drottz-Sjoeberg, B.M. Stockholm School of Economics (Sweden). Center for Risk Research. Jun 1993. 18p. Order Number DE95627109. Source: OSTI; NTIS; INIS.

Crisis handling in most kinds of disasters is affected by e.g. the information situation, prior experience and preparedness, availability of resources, efficiency of leadership and coordination, and type of disaster. A nuclear accident creates a situation which differs from many 'normal' disasters and natural catastrophes, for example with respects to the invisible nature of radiation and radioactive contamination and thus the dependence on access to specific technical equipment and expertise, and to information about the radiation situation. The scope of the accident, and the existing levels of radiation, define subsequent actions; information policies and existing channels of communication lay the foundation for public reactions. The present paper explores some examples of public reactions, and crisis handling of some previous radiation accidents on the basis of two dimensions, i.e. degree of information availability and degree of impact or 'environmental damage'. The examples include the radiation accidents in the Chelyabinsk region in the southern Urals, at Three Mile Island, USA, at Chernobyl in the Ukraine, and in Goiania, Brazil. It is concluded that public reactions differ as a function of existing expectations, and the crisis handling is more affected by the existing organizational and social structures than by needs and reactions of potential victims. Another conclusion is that pre-disaster preparedness regarding public information, and organization of countermeasures, are crucial to the outcome of a successful crisis handling and for enhancing public trust in crisis management. 39 refs, 2 figs.

15599 (HHS-CFR-B–13) **Perceived risks and risk attitudes in southern Russia in the aftermath of the Chernobyl accident.** Drottz-Sjoeberg, B.M. (Stockholm School of Economics (Sweden). Center for Risk Research); Rumyantseva, G.M.; Martyvshov, A.N. Stockholm School of Economics (Sweden). Center for Risk Research. Oct 1993. 62p. Order Number DE95627110. Source: OSTI; NTIS; INIS.

The present study was conducted within the framework of the Joint Study Project 2 (JSP2), a research project involving the European Community and the Commonwealth of Independent States. The task involved the investigation of public reactions to radioactive contamination due to the Chernobyl accident in 1986. The here presented field-work was designed as a pilot investigation in a series of studies aimed at contributing to the understanding of social and psychological factors relevant to the design of countermeasures in the case of a future nuclear accident. The report presents questionnaire data collected from people living in Novozybkov and its surroundings in Russia, in the summer of 1992. The chosen areas had an overall surface contamination level of 15-40 Ci/km^2. The results showed that the respondents recalled the date of the accident surprisingly well. They often indicated that they had heard the first news of the accident via TV, radio or rumors. They often reported the content of that information to have been related to an explosion or a fire at a nuclear plant. They indicated that they at the time had a rather modest reaction to the news. Current worries especially concerned health risks due to the radioactive contamination, although the respondents also emphasized that ordinary life was filled with worries. Middle-aged persons and parents often indicated the highest personal worry. Risk ratings related to radiation and radioactive contamination were high. Ratings of perceived change in risk level since the accident of a variety of hazards showed an overall increase. 27 refs, 23 figs, 23 tabs.

15600 (INIS-BR–3488) **Civil liability on nuclear activities.** Bittar, C.A. Sao Paulo Univ., SP (Brazil). Faculdade de Direito. 1982. 247p. (In Portuguese). Order Number DE95627093. Source: OSTI; NTIS (US Sales Only); INIS.

The civil liability theory in the actual context is shown in the first and second part of this thesis, including some considerations about concepts and types of liability in dangerous and not dangerous activities. In the third part, the legal aspects of civil liability for the nuclear activities are analyzed, with a brief description of the history evolution, standard systems, inspection corporation and juridical regulation. (C.G.C.). 239 refs.

15601 (INIS-mf–14184) **Master catalogue of foreign reports on the safety of nuclear installations and radiological protection, kept at federal Office for Radiation Protection on behalf o the Federal Ministry of the Environment Nature Conservation and Nuclear Safety.** Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). Feb 1993. 46p. (In German). Order Number DE95006003. Source: OSTI; NTIS (US Sales Only); INIS.

The literature is sent to the Federal Ministry of the Environment (BWU) by foreign institutes or organizations within the framework of bilateral agreements. The reports and documents dealing with radiation protection and the safety of nuclear installations are retrievable from the catalogue by author/title or serial title. The bibliographic description of literature items follows the alphabetical cataloging rules (RAK-WAB).

15602 (KFK–5426) **The release code package REVOLS/RENONS for fission product release from a liquid sodium pool into inert gas atmosphere.** Starflinger, J. (Bochum Univ. (Germany). Lehrstuhl fuer Nukleare und Neue Energiesysteme); Koch, M.K.; Brockmeier, U.; Schuetz, W.; Scholtyssek, W.; Unger, H. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung. Dec 1994. 72p. Contract ETNU-CT92-0077. (RUB-E–75). Order Number DE95769844. Source: OSTI; NTIS (US Sales Only); INIS.

For aerosol source term considerations in the field of nuclear safety, the investigation of the release of volatile and non-volatile species from liquid surfaces into a gas atmosphere is important. In case of a hypothetical liquid metal fast breeder reactor accident with tank failure, primary coolant sodium with suspended or solved fuel particles and fission products may be released into the containment. The computer code package REVOLS/RENONS, based on a theoretical mechanistic model with a modular structure, has been developed for the prediction of sodium release as well as volatile and non-volatile radionuclide release from a liquid pool surface into the inert gas atmosphere of the inner containment. Hereby the release of sodium and volatile fission products, like cesium and sodium iodide, is calculated using a theoretical model in a mass transfer coefficient formulation. This model has been transposed into the code version REVOLS.MOD1.1, which is discussed here. It enables parameter analysis under highly variable user-defined boundary conditions. Whereas the evaporative release of the volatile components is governed by diffusive and convective transport processes, the release of the non-volatile ones may be governed by mechanical processes which lead to droplet entrainment from the wavy pool surface under conditions of natural or forced convection into the atmosphere. The mechanistic model calculates the liquid entrainment rate of the non-volatile species, like the fission product strontium oxide and the fuel (uranium dioxide) from a liquid pool surface into a parallel gas flow. The mechanistic model has been transposed into the computer code package REVOLS/RENONS, which is discussed here. Hereby the module REVOLS (RElease of VOLatile Species) calculates the evaporative release of the volatile species, while the module RENONS (RElease of NON-Volatile Species) computes the entrainment release of the non-volatile radionuclides. (orig./HP)

15603 (NUREG–1514) **Guidance for a large tabletop exercise for a nuclear power plant.** Weinstein, E.D. (Nuclear Regulatory Commission, Washington, DC (United States). Office for Analysis and Evaluation of Operational Data); Bates, E.F.; Adler, M.V.; Gant, K.S. Nuclear Regulatory Commission, Washington, DC (United States). Office for Analysis and Evaluation of Operational Data; Oak Ridge National Lab., TN (United States). Mar 1995. 67p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

Tabletop exercises are held to discuss issues related to the response of organizations to an emergency event. This document describes in task format the planning, conduct, and reporting of lessons learned for a large interagency tabletop. A sample scenario, focus areas, and discussion questions based on a simulated accident at a commercial nuclear power plant are provided.

15604 (NUREG/CR–6192) **Aging and service wear of spring-loaded pressure relief valves used in safety-related systems at nuclear power plants.** Staunton, R.H. (Oak Ridge National Lab., TN (United States)); Cox, D.F. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering Technology; Oak Ridge National Lab., TN (United States). Mar 1995. 80p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL–6791). Source: OSTI; NTIS; GPO; INIS.

Spring-loaded pressure relief valves (PRVS) are used in some safety-related applications at nuclear power plants. In general, they are used in systems where, during accidents, pressures may rise to levels where pressure safety relief is required for protection of personnel, system piping, and components. This report documents a study of PRV aging and considers the severity and causes of service wear and how it is discovered and corrected in various systems, valve sizes, etc. Provided in this report are results of the examination of the recorded failures and identification of trends and relationships/correlations in the failures when all failure-related parameters are considered. Components that comprise a typical PRV, how those components fail, when they fail, and the current testing frequencies and methods are also presented in detail.

15605 (NUREG/CR–6220) **An assessment of fire vulnerability for aged electrical relays.** Vigil, R.A. (Sandia National Labs., Albuquerque, NM (United States)); Nowlen, S.P. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering Technology; Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 36p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–94-0769). Source: OSTI; NTIS; INIS; GPO.

There has been some concern that, as nuclear power plants age, protective measures taken to control and minimize the impact of fire may become ineffective, or significantly less effective, and hence result in an increased fire risk. One objective of the Fire Vulnerability of Aged Electrical Components Program is to assess the effects of aging and service wear on the fire vulnerability of electrical equipment. An increased fire vulnerability of components may lead to an overall increase in fire risk to the plant. Because of their

widespread use in various electrical safety systems, electromechanical relays were chosen to be the initial components for evaluation. This test program assessed the impact of operational and thermal aging on the vulnerability of these relays to fire-induced damage. Only thermal effects of a fire were examined in this test program. The impact of smoke, corrosive materials, or fire suppression effects on relay performance were not addressed in this test program. The purpose of this test program was to assess whether the fire vulnerability of electrical relays increased with aging. The sequence followed for the test program was to: identify specific relay types, develop three fire scenarios, artificially age several relays, test the unaged and aged relays in the fire exposure scenarios, and compare the results. The relays tested were Agastat GPI, General Electric (GE) HMA, HGA, and HFA. At least two relays of each type were artificially aged and at least two relays of each type were new. Relays were operationally aged by cycling the relay under rated load for 2,000 operations. These relays were then thermally aged for 60 days with their coil energized.

15606 (NUREG/CR–6235) **Assessment of short through-wall circumferential cracks in pipes. Experiments and analysis: March 1990–December 1994.** Brust, F.W. (Battelle, Columbus, OH (United States)); Scott, P.; Rahman, S. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering Technology; Battelle, Columbus, OH (United States). Apr 1995. 243p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract FG02-90ER14135. (BMI–2179). Source: OSTI; NTIS; GPO; INIS.

This topical report summarizes the work performed for the Nuclear Regulatory Commission's (NRC) research program entitled "Short Cracks in Piping and Piping Welds" that specifically focuses on pipes with short through-wall cracks. Previous NRC efforts, conducted under the Degraded Piping Program, focused on understanding the fracture behavior of larger cracks in piping and fundamental fracture mechanics developments necessary for this technology. This report gives details on: (1) material property determinations, (2) pipe fracture experiments, and (3) development, modification, and validation of fracture analysis methods. The material property data required to analyze the experimental results are included. These data were also implemented into the NRC's PIFRAC database. Three pipe experiments with short through-wall cracks were conducted on large diameter pipe. Also, experiments were conducted on a large-diameter uncracked pipe and a pipe with a moderate-size through-wall crack. The analysis results reported here focus on simple predictive methods based on the J-Tearing theory as well as limit-load and ASME Section 11 analyses. Some of these methods were improved for short-crack-length predictions. The accuracy of the various methods was determined by comparisons with experimental results from this and other programs. 69 refs., 124 figs, 49 tabs.

15607 (NUREG/CR–6300) **Refinement and evaluation of crack-opening-area analyses for circumferential through-wall cracks in pipes.** Rahman, S. (Battelle, Columbus, OH (United States)); Brust, F.; Ghadiali, N.; Krishnaswamy, P.; Wilkowski, G.; Choi, Y.H.; Moberg, F.; Brickstad, B. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering Technology; Battelle, Columbus, OH (United States). Apr 1995. 224p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract FG02-90ER14135. (BMI–2184). Source: OSTI; NTIS; GPO; INIS.

Leak-before-break (LBB) analyses for circumferentially cracked pipes are currently being conducted in the nuclear industry to justify elimination of pipe whip restraints and jet impingement shields which are present because of the expected dynamic effects from pipe rupture. The application of the LBB methodology frequently requires calculation of leak rates. These leak rates depend on the crack-opening area of a through-wall crack in the pipe. In addition to LBB analyses, which assume a hypothetical flaw size, there is also interest in the integrity of actual leaking cracks corresponding to current leakage detection requirements in NRC Regulatory Guide 1.45, or for assessing temporary repair of Class 2 and 3 pipes that have leaks as are being evaluated in ASME Section 11. This study was requested by the NRC to review, evaluate, and refine current analytical models for crack-opening-area analyses of pipes with circumferential through-wall cracks. Twenty-five pipe experiments were analyzed to determine the accuracy of the predictive models. Several practical aspects of crack-opening such as; crack-face pressure, off-center cracks, restraint of pressure-induced bending, cracks in thickness transition regions, weld residual stresses, crack-morphology models, and thermal-hydraulic analysis, were also investigated. 140 refs., 105 figs., 41 tabs.

15608 (SAND–95-0561C) **Progress in MELCOR development and assessment.** Summers, R.M. (Sandia National Labs., Albuquerque, NM (United States). Modeling and Analysis Dept.); Kmetyk, L.N.; Cole, R.K. Jr.; Smith, R.C.; Elsbernd, A.E.; Stuart, D.S.; Thompson, S.L. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941074–2: 21. water reactor safety information meeting, Washington, DC (United States), 25-27 Oct 1994). Order Number DE95009590. Source: OSTI; NTIS; INIS; GPO Dep.

MELCOR models the progression of severe accidents in light water reactor nuclear power plants. Recent efforts in MELCOR development to incorporate CORCON-Mod3 models for core-concrete interactions, new models for advanced reactors, and improvements to several other existing models have resulted in release of MELCOR 1.8.3. In addition, continuing efforts to expand the code assessment database have filled in many of the gaps in phenomenological coverage. Efforts are now under way to develop models for chemical interactions of fission products with structural surfaces and for reactions of iodine in the presence of water, and work is also in progress to improve models for the scrubbing of fission products by water pools, the chemical reactions of boron carbide with steam, and the coupling of flow blockages with the hydrodynamics. Several code assessment analyses are in progress, and more are planned.

15609 (SIEMENS-KWU-S–554/92/011) **UPTF-TRAM test A2. Formation of stratified flow in the hot leg.** Tenckhoff; Brand, B.; Weiss, P. Siemens AG Unternehmensbereich KWU, Erlangen (Germany). Bereich Energieerzeugung; Siemens AG Unternehmensbereich KWU, Erlangen (Germany). Werkstoffe und Chemie. Oct 1992. 503p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 1500876. Order Number DE95768722. Source: OSTI; NTIS (US Sales Only); INIS.

The separate effect UPTF TRAM Test A2 consisting of six runs was designed to investigate flow regimes in the hot leg of a pressurized water reactor under two-phase natural circulation conditions. In particular, the following phenomena were investigated: - Formation of different flow regimes, e.g. stratified and slug flow in the hot leg under different boundary conditions; - Correlation between flow regime and boundary conditions of the system (mass flows, water level etc.); - Mechanism of the transport of water into the steam generator. The test runs are divided into two groups: (a) Test Runs 01a, 01b and 02b with steam injection through the core simulator: In these test runs the steam injection through the core simulator was increased stepwise. In each step the steam injection was kept constant for about 100 s in order to observe steady water distribution in the hot leg and SG-simulator of broken loop. (b) Test Runs 03c, 04c and 04d with steam and water injection through the core simulator: These test runs were performed at a constant steam injection rate and the water injection rate was increased stepwise. In order to verify the consistency of scaling with the pressure, the test runs were carried out at different pressures as: (a) Runs 01a and 01b at 15 bar, and Run 02b at 3 bar (b) Runs 03c, 04c and 04d at 15, 3 and 5 bar respectively. A preliminary evaluation of the test is presented in the Quick Look Report. (orig.)

15610 (SIEMENS-KWU-S–554/92/013) **UPTF test instrumentation. Measurement system identification, engineering units and computed parameters.** Sarkar, J.; Liebert, J.; Laeufer, R. Siemens AG Unternehmensbereich KWU, Erlangen (Germany). Bereich Energieerzeugung. Nov 1992. 327p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 1500876. Order Number DE95770095. Source: OSTI; NTIS (US Sales Only); INIS.

This updated version of the previous report /1/contains, besides additional instrumentation needed for 2D/3D Programme, the supplementary instrumentation in the inlet plenum of SG simulator and hot and cold leg of broken loop, the cold leg of intact loops and the upper plenum to meet the requirements (Test Phase A) of the UPTF Programme, TRAM, sponsored by the Federal Minister of Research and Technology (BMFT) of the Federal Republic of Germany. For understanding, the derivation and the description of the identification codes for the entire conventional and advanced measurement systems classifying the function, and the equipment unit, key, as adopted in the conventional power plants, have been included. Amendments have also been made to the appendices. In particular, the list of measurement systems covering the measurement identification code, instrument, measured quantity, measuring range, band width, uncertainty and sensor location has been updated and extended to include the supplementary instrumentation. Beyond these amendments, the uncertainties of measurements have been precisely specified. The measurement identification codes which also stand for the identification of the corresponding measured quantities in engineering units and the identification codes derived therefrom for the computed parameters have been adequately detailed. (orig.)

15611 (SIEMENS-KWU-S–554/93/002) **UPTF-TRAM test A3. Turn-over of the hot-leg injected ECC in the steam generator direction.** Tenckhoff; Brand, B.; Weiss, P. Siemens AG Unternehmensbereich KWU, Erlangen (Germany). Bereich Energieerzeugung; Siemens AG Unternehmensbereich KWU, Erlangen (Germany). Werkstoffe und Chemie. Jun 1993. 538p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 1500876. Order Number DE95768721. Source: OSTI; NTIS (US Sales Only); INIS.

The UPTF TRAM test A3 was a separate effects test to investigate the interaction between the hot leg-injected ECC and the single-phase or two-phase natural circulation in the hot leg in the case of an SBLOCA in a PWR. The experimental investigation of 7 runs was mainly concentrated on the following phenomena: - Transport of hot leg injected ECC water to the upper plenum or in the direction of steam generator, depending on the loop mass flow, - Utilization of the condensation potential of ECC water, - Mixing of the saturated water with the ECC water, - Effect of hot leg injection on the flow phenomena in the hot leg, - Effect of pressure (3 and 15 bar) on the scaling and hence the verification of the scaling concept applied. A preliminary evaluation of the test is presented in the Quick Look Report. (orig.)

15612 (WHC-SA–2633) **Snubber reduction analysis of secondary hot leg in Fast Flux Test Facility.** Chen, W.W.; Lindquist, M.R. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950740–8: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95006629. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes analyses to qualify the structural integrity of the secondary hot leg (SHL) dump heat exchanger(DHX) piping system of the Fast Flux Test Facility (FFTF) under seismic loading after the deletion of a number of seismic snubbers. A baseline geometric model was developed, with ADLPIPE computer code, Version 2EIA, 1984. Several seismic analyses were performed by iteration with the maximum number of snubbers reduced to obtain a support configuration having acceptable anchor and support loads as well as acceptable piping stresses. A thermal analysis was performed at an operating temperature of 965°F (518°C) to qualify the piping system following the replacement of some seismic snubbers with rigid supports. A series of displacements from flow- or pump-induced vibration were measured. These vibrations, on the order of tens of seconds or minutes apart, were not continuous and steady, but rather of a series of forced displacements that rapidly damped out to zero. A scoping evaluation of the effect of the vibration found that the calculated stress is within limits. Results of the stress analysis of the piping with snubber reduction are qualified in accordance with ASME, Section III, Class 1, requirements. Nearly 67% of the snubbers in loop 1 of the SHL piping system may be eliminated or replaced with rigid struts at the same location and orientation. The effects of inelastic strain accumulation, creep-fatigue damage and interaction, and elastic follow-up are evaluated by comparison to the results of inelastic analysis. Revised anchor and hanger loads also were evaluated by comparison to those from the original seismic analysis.

24 POWER TRANSMISSION AND DISTRIBUTION

2401 Power Systems

Refer also to citation(s) 17325

15613 (NREL/TP–441-7807) **HYBRID2 – A versatile model of the performance of hybrid power systems.** Green, H.J. (National Renewable Energy Lab., Golden, CO (United States)); Manwell, J. National Renewable Energy Lab., Golden, CO (United States). Apr 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-950309–1: 25. annual conference and exhibition on wind power, Washington, DC (United States), 26-30 Mar 1995). Order Number DE95004062. Source: OSTI; NTIS; GPO Dep.

In 1993, the National Renewable Laboratory (NREL) made an assessment of the available tools from the United States and Europe for predicting the long-term performance of hybrid power systems. By hybrid power the authors mean combinations of two or more power sources wind turbines, photovoltaics (PV), diesel gensets, or other generators into integrated systems for electric power generation in remote locations. Their conclusion was that there was no single, user-friendly tool capable of modeling the full range of hybrid power technologies being considered for the 1990s and beyond. The existing tools were, in particular, lacking flexibility in system configuration and in dispatch of components. As a result, NREL developed a specification for a model, called HYBRID2, for making comparisons of competing technology options on a level playing field. This specification was prepared with a range of potential users in mind including not only the US Department of Energy (DOE) renewable energy programs, but also the US wind industry, technical consultants, international development institutions/banks, and rural electrification programs in developing countries. During 1994, NREL and subcontractor, the University of Massachusetts (UMass), began development of HYBRID2 with funding from the DOE Wind Energy Program. It builds on the wind/diesel model, HYBRID1, developed previously by UMass, and expands that model to accommodate the wider array of technologies used in hybrid power systems. This paper will provide an overview of the model's features, functions, and status.

15614 (ORNL/TM–12619) **Bonneville Power Administration Communication Alarm Processor (CAP). Final report.** MacGregor, D.G. (MacGregor-Bates, Inc., Eugene, OR (United States)); Goeltz, R. Oak Ridge National Lab., TN (United States). Jan 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009656. Source: OSTI; NTIS; GPO Dep.

Power systems operations and maintenance currently face an ever-increasing need for a high level of computerized support. This paper is the final report of a research and development effort undertaken by the Bonneville Power Administration to develop a computerized decision support system to aid operations and maintenance personnel isolate and diagnose faults on a microwave communication system used for centralized dispatch operations. The system, called CAP for Communication Alarm Processor, provides statistical analysis of microwave communication system alarms, as well as an expert system capability for fault isolation and diagnosis. CAP is implemented on a DEC VAX Station 3100 computer, utilizing both knowledge-based programming principles as well as conventional programming techniques.

2402 Power System Networks, Transmission and Distribution

15615 (CONF-9505196–1) **Computer-aided coordination and overcurrent protection for distribution systems.** Tolbert, L.M. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States);Institute of Electrical and Electronics Engineers, Inc., New York, NY (United States). DOE Contract AC05-84OR21400. From 1995 industrial and commercial power systems conference; San Antonio, TX (United States); 8-10 May 1995. Order Number DE95008844. Source: OSTI; NTIS; GPO Dep.

Overcurrent protection and coordination studies for electrical distribution systems have become much easier to perform with the emergence of several commercially available software programs that run on a personal computer. These programs have built-in libraries of protective device time-current curves, damage curves for cable and transformers, and motor starting curves, thereby facilitating the design of a selectively coordinated protection system which is also well-protected. Additionally, design time when utilizing computers is far less than the previous method of tracing manufacturers' curves on transparent paper. Basic protection and coordination principles are presented in this paper along with several helpful suggestions for designing electrical protection systems. A step-by-step methodology is presented to illustrate the design concepts when using software for selecting and coordinating the protective devices in distribution systems.

2403 Power Transmission Lines and Cables

Refer also to citation(s) 17027, 17033, 17036

15616 (CONF-9407153–Vol.1, pp. 45-49) **Superconducting fault current limiter for power utility application.** Leung, E. (Martin Marietta Corp., Oak Ridge, TN (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

Recent accomplishments in the development of superconducting fault current limiters for power systems are outlined. These accomplishments include the comprehensive requirement for fault current limiters developed by SCE; down-selection; bridge concepts; shunt concepts; and high resistivity matrix substrates for HTS conductors. The proposed Phase II SPI-FCL Program is outlined. It is concluded that the SPI fault current limiter program will benefit both the power utility industry as well as the high temperature superconductivity community and progress of Phase I is right on target.

15617 (CONF-9407153–Vol.1, pp. 75-103) **HTS Wire Development Group: Achievements, technology transfer, and plans.** Riley, G.N. Jr. (American Superconductor Corp., Westborough, MA (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The objective of the HTS wire development group is to develop high performance HTS wire for use in electric power systems. The HTS wire development group personnel is listed. The HTS wire development group achievements are outlined. These achievements include: focusing on the development of high performance and cost effective HTS wire; HTS wires were fabricated in laboratory scale and production scale lengths; ACS has fabricated the only conductor in the world to meet or surpass the DOE FY94 goals for electric power applications development; these wire fabrication successes at ASC are a direct result of the long-term collaboration between ASC and the other HTS Wire Development Group members; and plans are in place for a successful FY95 program.

2404 Health and Safety

15618 (DOE/BP–1-9351) **Rules of conduct for persons entering substations: Green cross for safety.** USDOE Bonneville Power Administration, Portland, OR (United States). Mar 1995. 24p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009163. Source: OSTI; NTIS; GPO Dep.

This is a field orientation guide for unescorted entry and performance of work not affecting the electrical operation of the BPA power system. The mandatory rules express minimum requirements for dealing with the main hazards encountered in daily work activities. These and other written requirements must be continually reinforced on each assigned task through the safety judgments of each BPA and contractor worker.

15619 (NEI-DK–1952) **Magnetic fields at workplaces.** Lous, H. (ELKRAFT (Denmark)); Yde, K. Danske Elvaerkers Forening, Copenhagen (Denmark). Dec 1992. 11p. (In Danish). Order Number DE95772350. Source: OSTI; NTIS.

Summaries of a selection of available results found in relevant literature on the subject of occupational exposure to magnetic fields are presented. Information is also given as to which types of field employees are most often exposed. Limits given for exposure to magnetic fields with regard to employees are described and IRPA (International Radiation Protection Association) guidelines are given. The subjects of leukemia, brain and other forms of cancer are very briefly dealt with and exposure to magnetic fields with regard to persons working with electricity/industry, such as electricians at power stations and welders employed by shipbuilding firms are specifically and shortly dealt with. (AB)

2405 Environmental Aspects

15620 (DOE/EIS–0183) **Business plan: Supplemental draft environmental impact statement. Volume 2. Appendices.** USDOE Bonneville Power Administration, Portland, OR (United States). Feb 1995. 179p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2544). Order Number DE95009169. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the appendices for the Bonneville Power Administration (BPA) Business Plan: Supplemental Draft Environmental Impact Statement. Included are: BPA products and services; Rate design; Methodology and assumptions for numerical analysis; Retail utility operations; Comments and responses to the draft business plan EIS.

2407 Economic, Industrial, and Business Aspects

15621 (INIS-mf–14486) **Prerequisites to promote energy efficiency investments in Bulgaria.** Boernsen, O. (Gopa Consultants (Germany)). No corporate text available. 1994. 6p. (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627083. Source: OSTI; NTIS (US Sales Only); INIS.

The PHARE Energy Programme's team observation and advice to the Committee of Energy in Bulgaria are outlined. In comparison to the Western European countries energy intensity in Bulgaria is 2-3 times higher. It is explained by the energy intensive industrial structure and the old and depreciated capital equipment. Cost-covering energy prices would make energy efficiency investment financially feasible and would attract financiers. But the lesson from Western European experience is that availability of finance capital and cost reflecting energy prices is not at all a necessary prerequisite for energy efficiency improvement. This improvement can be achieved with no cost or low cost measures. The potential for energy efficiency in industry (consuming more than 50% of the energy) is 11%-20%; in buildings - 6%; in transport - 4%. There are other obstacles, as lack of information, other business interests and no internal expertise, especially for small and medium size industries. The basic prerequisite to improve energy efficiency is raising of awareness and change of management culture, as well as radical change in organisational and management structures. (orig.).

15622 (INIS-mf–14490) **Efficient energy usage and creation of tariff policy for household and industrial sectors through**

remote control of distribution network. Vinchev, E. Komitet po Energetika, Sofia (Bulgaria). 1994. 5p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627084. Source: OSTI; NTIS (US Sales Only); INIS.

The advantages of the remote control of distribution network in market-oriented economic policy are stressed and the most important features of its main components are outlined. The author underlines the necessary changes in the Bulgarian electric power supply system aiming at improving energy usage efficiency, simplicity and transparency in customer relationships and decreasing peak power demand. This new network control approach will optimise the use of multi rate tariff power meters and pricing of electricity and will result in all loads being served at minimal total cost. An evaluation of the benefits and expenditures for applying such a system is given. The experience of the town of Varna with similar system developed at ABB ZPA Trutnov (Czech Republic) is described as a successful example of implementation of this technology. 1 fig. (orig.).

15623 (INIS-mf–14494) **Is the fuel and energy consumption in Bulgaria effective?.** Manoilova, T.; Popsavov, L.; Tsaleva, E. Energoproekt, Sofia (Bulgaria). 1994. 10p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627085. Source: OSTI; NTIS (US Sales Only); INIS.

Data on the difficult energy situation in Bulgaria for the period 1987-1992 are presented. The reasons for the drop in fuel and energy consumption and the corresponded decrease in GNP are discussed. The main contribution to the real decrease in gross national product (GNP) has the drop in surplus value of industry - 16.5 % in 1992 compared to 1991. As a result the relative share of industry in GNP decreases. The substantial drop of the surplus value in industry is due to the cutting of sales in the most important industrial branches. The drop in production leads to drop in consumption of primary and final energy sources by 11% in 1991-1992. The fuel/energy balance shows a dramatic decrease in gross consumption of primary energy resources. This is influenced in some degree by the decrease in consumption of imported primary energy resources, which dropped by 20 % in 1992. The consumed primary energy/fuel sources per unit GNP are changed for 1990-1991-1992 in relation 1-1.86-1.35. The sectoral analysis (industry, agriculture and services) shows a trend towards a strong increase in energy intensity per GNP. 6 tabs., 1 fig. (orig.).

15624 (INIS-mf–14495) **Short-term forecasting of thermal energy consumption based on neural net.** Minkov, Ts. Nauchno-Tekhnicheski Syyuz na Energetitsite, Sofia (Bulgaria). 1994. 6p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627086. Source: OSTI; NTIS (US Sales Only); INIS.

The optimal energy saving management of a district heating system requires forecasting of its main parameter - the thermal load. It is expressed in forecasting of the temperature scheduling and the thermal energy consumption. The author proposes an approach for short-term forecasting of the thermal energy consumption based on artificial neural network (ANN) methods. A back-propagation algorithm is used for the training process. The input layer of the network includes: 5 nodes for consumption profiles determining 24 discrete values of the load; 11 nodes for current and past temperature values; 4-5 nodes for forecast values of some parameters. The optimal network architecture determined by the Dynamic Node Creation method consists of 14 neurons in the 'hidden' layer. Archive data about the operation of the ZEMLYANE Heating Station (Sofia, BG) for a 5 month period are used as training facts. The network was tested on independent excerpt of data comprising a 7 day period. The average error at testing is about 1.5%. The model is developed by Neural Desk 2.11 for PC. The results of the tested cases look promising and confirm the validity of the ANN approach for solving the problems of energy load in heating systems. 1 tab., 3 figs., 5 refs. (orig.).

15625 (INIS-mf–14497) **Operational management of district heating system -artificial intelligence approach.** Sotirov, G.; Chonkov, I.; Penev, P.; Minkov, Ts. Vissh Massinno-Elektrotekhnicheski Inst., Sofia (Bulgaria). 1994. 13p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627087. Source: OSTI; NTIS (US Sales Only); INIS.

Solution of energy saving problems in the heating systems are based on the approaches of modern control theory. Some aspects of artificial intelligence (AI) have direct application in operational management of such kind of objects. The tasks as choice of equipment, distribution of the load between the parallel working units and short-term forecasting of the heat load are tackled. The solution of these tasks is carried out by integration of a knowledge base and artificial neuron networks in algorithms of mathematical programming. The possibilities for using the fuzzy logic apparatus for management of such objects are commented, as well as for development of an expert system. The studies are based on real operational data from ZEMLYANE Heating System, Sofia (BG). 20 refs., 3 figs., 1 tab. (orig.).

15626 (INIS-mf–14498) **Aspects of marginal expenditures in energy sector.** Stojchev, D.; Kynev, K. Energokibernetika Ltd., Sofia (Bulgaria). 1994. 6p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627088. Source: OSTI; NTIS (US Sales Only); INIS.

Technical and economical problems of marginal analysis methodology, its application procedure in energy sector and marginal expenditures determination are outlined. A comparative characteristics of the application is made for different periods of time. The differences in calculation of the marginal expenditures and prices are discussed. The operational costs, investments and inflation are analyzed. The mechanism of application of this approach in different planing horizon is outlined. The role of the change in the costs in time, the time unit, volume, the scope of application, etc. are determined. The areas of transition from one to other form of marginal expenditures are shown. 4 refs. (orig.).

15627 (INIS-mf–14499) **Restructuring and privatization in energy sector.** Stojchev, D.; Pyrvanov, V. Energokibernetika Ltd., Sofia (Bulgaria). 1994. 7p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627089. Source: OSTI; NTIS (US Sales Only); INIS.

The ways of solving problems of the transition period to market economy are discussed. The current conditions in Bulgarian energy sector are defined taking into account different processes, stages, elements, objects. The criteria of the transition -economical. technological, organizational, social, ecological -and the problems - unemployment, requalification, privatization, contamination - are postulated. The recent experience of Bulgaria and other ex-communist countries in restructuring and privatization of the economy are considered. The scope of suitable approaches, methods, means and rates are outlined. The mechanisms of the tackled processes are analyzed by comparative investigation and management ways for impact on different levels are looked for. The possible consequences of given situation, advantages and shortcomings of different alternatives are formulated. The ways for assessment and selection of compromise solutions are proposed. An overall technology for assessment and application of different ways of transition is discussed. Their tools for business estimation of economic units, the legislative, economic and social aspects of the process are scrutiny observed. Some problems of a real example of application of proposed assessment are discussed. Conclusions about methodology and efficiency of different alternatives are made. 2 refs.

15628 (INIS-mf–14502) **PHARE Energy Program for Bulgaria - restructuring and energy efficiency.** Yurukov, I.; Stariradev, V. Komitet po Energetika, Sofia (Bulgaria). 1994. 16p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627090. Source: OSTI; NTIS (US Sales Only); INIS.

The assistance of European Community and the G7 countries in the framework of the PHARE program in Bulgaria began in 1990 and till now three indicative programs for overall value of Ecu 275 million are signed. The Project Management Group (PMG) in the field of conventional energy sources was created in 1992 which is responsible for coordination of the projects and their financing by

foreign governmental and non-governmental organizations. The main part of the projects are devoted to organization of energy policy, energy saving and energy efficiency, utilization of domestic lignite, domestic usage of gas, improvement in power generating systems, optimization of district heating systems, assessment of renewable energy sources, adaptation of energy sector to the requirements of market economy. A detailed description is given to the aims, main tasks, expected results and current status of the particular sub projects. 5 refs.

25 ENERGY STORAGE

Refer also to citation(s) 15807

2501 Magnetic

15629 (ANL/ET/CP–84445) **Competition between SMES and flywheels.** Hull, J.R. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410238–2: International Energy Agency symposium on the use of superconductivity in energy storage, Karlsruhe (Germany), 25-27 Oct 1994). Order Number DE95005834. Source: OSTI; NTIS; GPO Dep.

The benefits of flywheel energy storage using high-temperature superconducting bearings is compared to that of SMES for the same applications. Flywheels cover the same range of energy storage times as SMES but their scaling relationships make them inherently more amenable to modular manufacture. In addition, the magnetic fields seen by the environment are considerably reduced for flywheels.

2504 Capacitor Banks

15630 (NEI-DK–1938) **All solid state lithium polymer supercapacitor.** Ge, P. (ed.). Innovision A/S, Odense (Denmark). Jan 1995. 25p. Contract ENS-1443/92-0005. Order Number DE95772355. Source: OSTI; NTIS.

EFP-92.

Specific capacitance and internal resistance of selected carbons have been measured with different electrolytes. A maximum value of 80 F/g has been obtained. The internal resistance depends mainly on the ionic conductivity of the electrolyte. Chemical or physical pretreatments had no positive influence on the electrochemical properties of activated carbons, except of carbon blacks. In our experimental conditions, the maximum nominal voltage is between 2.5 and 3 V. The theoretical maximum power density (without packaging and connection) of these carbons with a high conducting electrolyte (1.4 10-2 S/cm) is close to 3 kW/l. Significant progress has been made in terms of energy and power densities for the last generation of Innovision supercapacitors, but their characteristics remain for the moment lower than those obtained with liquid electrolytes. Problems of collector corrosion, electrode percolation and carbon wettability have to be solved. (au)

2505 Flywheels

Refer also to citation(s) 15629

2509 Batteries

Refer also to citation(s) 15613, 15675

15631 (ANL/CMT/CP–83389) **Lessons learned in acquiring new regulations for shipping advanced electric vehicle batteries.** Henriksen, G. (Argonne National Lab., IL (United States)); Hammel, C.; Altemos, E.A. Argonne National Lab., IL (United States). Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941221–3: 12. International electric vehicle symposium, Anaheim, CA (United States), 5-7 Dec 1994). Order Number DE95009908. Source: OSTI; NTIS; GPO Dep.

In 1990, the Electric and Hybrid Propulsion Division of the US Department of Energy established its ad hoc EV Battery Readiness Working Group to identify regulatory barriers to the commercialization of advanced EV battery technologies and facilitate the removal of these barriers. A Shipping Sub-Working Group (SSWG) was formed to address the regulatory issues associated with the domestic and international shipment of these new battery technologies. The SSWG invites major industrial developers of advanced battery technologies to join as members and work closely with appropriate domestic and international regulatory authorities to develop suitable regulations and procedures for the safe transport of these new battery technologies. This paper describes the domestic and international regulatory processes for the transport of dangerous goods; reviews the status of shipping regulations for sodium-beta and lithium batteries; and delineates the lessons learned to date in this process. The sodium-beta battery family was the first category of advanced EV batteries to be addressed by the SSWG. It includes both sodium/sulfur and sodium/metal chloride batteries. Their efforts led to the establishment of a UN number (UN 3292) in the UN Recommendations, for cold cells and batteries, and establishment of a US Department of Transportation general exemption (DOT-E-10917) covering cold and hot batteries, as well as cold cells. The lessons learned for sodium-beta batteries, over the period of 1990–94, are now being applied to the development of regulations for shipping a new generation of lithium battery technologies (lithium-polymer and lithium-aluminum/iron sulfide batteries).

29 ENERGY PLANNING AND POLICY

2901 Energy Analysis and Modeling

Refer also to citation(s) 15679

15632 (IMFUFA–291, [pp. 21]) **The use of life-cycle analysis to address energy cycle externality problems.** Soerensen, B. (Roskilde University, Institute of Mathematics and Physics, Roskilde (Denmark)). Roskilde Universitetscenter (Denmark). Inst. for Studiet af Matematik og Fysik samt deres Funktioner i Udervisning, Forsning og Anvendelser. 1995. Contract ENS-1753/94-0001. In *1. Annual report from the project life-cycle analysis of the total Danish energy system. An example of using methods developed for the OECD/IEA and the US/EU fuel cycle externality study.* 96p. Order Number DE95766518. Source: OSTI; NTIS.

EFP-94.

The work reported in the present communication is based on several years of consultancy to the OECD regarding the methodology of life-cycle analysis, followed by implementation studies performed for the Danish Department of Energy and as a contractor for the Fuel Cycle Externality Project of the European Community Joule II Programme. The work also underlies the author's work as a member of the IPCC (Intergovernmental Panel on Climate Change) working group II and consultant to working group III. (au) (22 refs.)

15633 (NEI-DK–1910, pp. 11-32) **Sustainable development as a planning goal for energy systems in the Nordic and Baltic area.** Halsnaes, K. (Risoe National Laboratory, Systems Analysis Department, roskilde (Denmark)); Morthors, P.O. Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

Energy consumption and production are important contributors to environmental problems on a global, regional and local geographical scale. Furthermore, the management of energy systems involves some interesting resource economic problems. The environmental impact of the energy system and the resource management problem can be handled in an integrated way within a concept of sustainable energy development. This concept is described in more detail in the following, and some results for Denmark and the Nordic-Baltic area are reported. (au) (10 refs.)

15634 (NEI-DK–1910, pp. 71-82) **Energy strategies for the Baltic countries.** Fenhann, J. (Risoe National Lab., Energy Systems, System Analysis Department, Roskilde (Denmark)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment,

Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

In the transition process to modern societies Estonia, Latvia and Lithuania faces serious problems in all sectors. Old centralized organizations are being broken down and new structures are being build. In this time of transformation energy problems must be given high priority because the present situation with high energy imports makes the countries very vulnerable to events in other countries, and because the burning of fossil fuels on old equipment without cleaning facilities are responsible for the major part of emissions of environmentally damaging pollutants such as (SO_2, NO_x, CO_2...). Many of these pollutants are transboundary and the problems must therefore be solved by international collaboration. (au)

2902 Economics and Sociology

Refer also to citation(s) 14851, 15234, 15599, 15653, 15658, 15662, 15690, 15694, 15697, 15770, 15800, 16311, 16312, 16712

15635 (ANL/EA/CP–85788) **Training implications of skills needed for environmental cleanup.** Young, C. (Argonne National Lab., IL (United States)); Hensley, J.; Lehr, J. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409328–1: Annual meeting of the North American Association for Environmental Education, Cancun (Mexico), 23-27 Sep 1994). Order Number DE95008301. Source: OSTI; NTIS; GPO Dep.

Well-trained staff are needed to perform the diverse tasks associated with environmental cleanup. Although educational and training programs are intended to help professionals learn relevant environmental skills, these programs may or may not be teaching the most appropriate skills. This project investigated the skills needed to carry out environmental activities at a headquarters office of a federal agency. The primary skills needed for environmental cleanup activities emphasize program management, problem solving/critical thinking, and communications. Furthermore, using Bloom's taxonomy of educational objectives, most of these skills fell into the areas of "application" or "evaluation." The results of this investigation suggest that rather than focusing on discipline-specific activities, such as helping improve people's knowledge about regulatory requirements, training and education should emphasize complex problem-solving skills.

15636 (ANL/EAIS/PP–80565) **Factors affecting minority population proximity to hazardous facilities.** Nieves, L.A. (Argonne National Lab., IL (United States)); Nieves, A.L. Argonne National Lab., IL (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009907. Source: OSTI; NTIS; GPO Dep.

Disproportionate exposure of minority groups to environmental hazards has been attributed to "environmental racism" by some authors, without systematic investigation of the factors underlying this exposure pattern. This study examines regional differences in the proximity of African-Americans, Hispanics, Asians, and non-Hispanic Whites to a broad range of facility types and explores the effects of urban and income factors. A statistically significant inverse relationship is found between the percentage of non-Hispanic Whites and virtually all facility categories in all regions. Except for Hispanics in the South, all such associations for minority groups show a direct relationship, though some are nonsignificant. The geographic concentration of facilities is more closely tied to urbanization than to economic factors. Controlling for both urban and economic factors, minority population concentration is still a significant explanatory variable for some facility types in some regions. This finding is most consistent for African-Americans.

15637 (DOE/EP/10050–T3) **Energy Investment Advisory Series No. 2. Investment opportunities in Indochina's energy sector.** Hagen, R.E. East-West Center, Honolulu, HI (United States). Dec 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EP10050. Order Number DE95008743. Source: OSTI; NTIS; GPO Dep.

Indochina is well positioned to join Asia's recent record of impressive economic growth. Vietnam, with the largest population and its long coast, seems poised to be the first nation in Indochina to succeed. It, and to a lesser extent Laos and Cambodia, are well positioned to take advantage of future tends in energy and energy-related markets. Electricity, hydro, renewables and nuclear are discussed as well as oil and gas. Areas of the energy industry in which investment might be possible in each country are tabulated.

15638 (NEI-DK–1910, pp. 33-42) **Economic interpretation of sustainable development.** Birk Mortensen, J. (Copenhagen Univ., Inst. of Economics, Copenhagen (Denmark)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

The economic discussion of sustainable development show that it is possible to define the concept sufficiently precise to introduce it in economic models and to get some policy results. The concept of sustainable development does have meaning and practical implications for economic policy. The relation between sustainability as non-decreasing welfare over time and a non-declining stock of total capital including natural capital is very useful for implementing the concept for actual planning. Even rudimentary empirical measures and test of sustainability can be developed and applied and used in planning and evaluation of performance based on this idea. Weak or strong versions of the concept have been suggested and an interesting and clarifying debate within economics is going on. The debate also demonstrates that when the concept is defined more precisely - differences in opinions, standpoints and policy prescriptions show up. (EG)

15639 (NEI-DK–1910, pp. 43-53) **Environmental policy in (former) centrally planned economics. A Polish perspective.** Zylicz, T. (Polish Ministry of Environemntal Protection, Economics Department (Poland)); Sleszynski, J. Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

The aim of the paper is to identify the general causes of poor environmental performance of the European non-market economies and to discuss ways of its improvement. Poland's experiences are emphasized although most conclusions apply to any centrally planned economy. Former centrally planned economies constitute extremely non-homogeneous group and include Bulgaria, Czechoslovakia, Eastern part of Germany, Hungary, Poland, Romania and the Soviet Union. Moreover, the description 'former' in many cases appears still a wishful thinking only of the authors. The authors argue that the failure can not be explained in terms of system inefficiency exclusively. In addition to resource administrative allocation effect environmental abuse here has its policy roots as well. Despite their clear ineffectiveness the environmental policy favored emission charges rather than alternative non-financial instruments. There is an obvious tendency to adhere to this approach especially now and to wait until it allegedly produces right results in the new market context. The authors point out that administrative solutions in environmental policy are widely used by the OECD governments and that there is a every reason to use them in the reformed economies of Eastern Europe. This does not exclude an application of taxes or effluent charges. Moreover, this does not preclude developing transferable permits and permit markets wherever appropriate. (au) (14 refs.)

15640 (NEI-DK–1910, pp. 93-100) **The economic incentive of pollution control charges. Exceptions to the 'rule'.** Ugelow, J. (The Aarhus School of Business, Aarhus (Denmark)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

The simplistic picture of charges, which is often taken as the rule in determining of minimum cost solution to pollution control issues, misleads policymakers by making the use of charges seem flexible and reversible. Four potentially significant factors have been

offered as reasons why the firm will not be motivated to act according to popular theory. The first factor is that the firm in making an investment, which involves fixed costs, will not respond to a change in the charge value independent of this investment. The second factor is that the firm may choose to build in flexibility to any investment so that if charges change, the firm can alter pollution reduction accordingly. the third factor is that the firm is making choices between different kinds of technology which are operative over range. The fourth factor is that the firm values its investments according to actual costs and not opportunity costs and so may not choose to invest in pollution control if capital rationing points to a more profitable, competing investment. At this point, not enough analysis has been done to determine if the charge is still the most cost-effective way of treating pollution problems. It has been shown that the use of these 'economic incentives' are complicated. (EG)

15641 (NEI-DK–1963) **Integrated resource planning in Danish electricity supply.** Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark); ELKRAFT A.m.b.A., Ballerup (Denmark). 1994. 34p. Order Number DE95772390. Source: OSTI; NTIS; INIS.

Also published in Danish.

Integrated Resource Planning in Danish Electricity Supply is a development project run by a cooperation of Danish electric power companies. It takes environmental issues, such as energy conservation, into consideration in addition to the European Union's proposal for a directive on the introduction of competition within the common energy market. The concept of integrated resource planning is described as a tool that can be used for a total cost minimization of the activities on the supply side and the demand side, this concept is further elucidated. It is explained that there must be an economic balance between the efforts on both sides and that this will ensure a total cost minimization. Preconditions, related for example to socio-economics, and procedures (step-by-step planning), functional barriers, a definition of roles and international influence and dialogue are also discussed. Satisfaction is expressed for this method of integrated resource planning, yet uncertainty as to the future structure of the free electricity market implies a cautious implementation. (AB)

15642 (SAND–95-0435C) **The impact of technology on the economy.** Rogers, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9506145–1: 1995 Society for Experimental Mechanics spring conference, Grand Rapids, MI (United States), 12-14 Jun 1995). Order Number DE95008522. Source: OSTI; NTIS; GPO Dep.

This paper discusses, in a general way, the influence of technology on the economy. The target audience is engineers who are involved in technology development but who are not especially familiar with economics. The measure used for describing the health of an economy is productivity. The impact of technological developments on productivity is discussed.

15643 (UCRL-ID–119696) **A cross-cultural mentoring program.** Huang-Nissen, S.; Myers, R.Y. Lawrence Livermore National Lab., CA (United States). [1995]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009460. Source: OSTI; NTIS; GPO Dep.

This report summarized the results of the pilot Cross-Cultural Mentoring Program at Lawrence Livermore National Laboratory, from the inception of the program idea through its implementation and assessment. It discusses the benefits of mentoring, the origins of the program, program design and implementation, program assessment, and conclusions and recommendations.

15644 (Y/TS–1196) **Are self-directed work teams successful and effective tools for today's organization?.** Arnwine, A.D. Oak Ridge National Lab., TN (United States). Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009055. Source: OSTI; NTIS; GPO Dep.

The purpose of this research is to (1) show the effectiveness and success of self-directed work teams within the organization, (2) emphasize the importance of team building in the success of the team, and (3) assist organizations in building self-directed work teams. The researcher used a direct survey and studied the following team building techniques: (1) Is the team's mission clearly defined to each team member? (2) Are the goals clearly defined and achievable by all team members? (3) Will empowerment (decision-making power) be given equally to all team members? (4) Will open and honest communication be allowed among team members? (5) Will each team member be respected and valued for his/her position on the team? (6) Are self-directed work teams effectively rewarded for accomplishments? (7) Have team members received adequate training to effectively complete their job tasks? Upon completion of the literature review and statistical data, and after analyzing the seven areas of team building techniques, it was determined three of the four teams were successful and effective. The only area of concern to the organization is that the participants felt they did not have true ownership of their teams; that is, team members were not given full empowerment. According to this study and the review of literature, full empowerment must be given to achieve successful and effective teams. If true empowerment is not given, the team will suffer in other areas of team building, and the organization will lose a valuable tool.

2903 Environment, Health, and Safety

Refer also to citation(s) 14766, 14951, 14952, 14953, 14954, 14966, 14982, 14995, 15034, 15160, 15161, 15165, 15186, 15197, 15257, 15283, 15299, 15453, 15620, 15631, 15635, 15639, 15640, 15674, 15701, 15777, 16066, 16507

15645 (ANL/EA/CP–84258) **Accelerating RCRA corrective action: The principles of the DOE approach.** Kimmell, T.A. (Argonne National Lab., IL (United States)); Green, D.R.; Ranek, N.L.; Coalgate, J.L. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–110: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008287. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is involved in the remediation of environmental contamination at many of its facilities under the Resource Conservation and Recovery Act (RCRA). RCRA's corrective action provisions were established by the Hazardous and Solid Waste Amendments of 1984 (HSWA). In response to the HSWA mandate, EPA established a program for the conduct of RCRA corrective action that was similar to that established under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). In addition, EPA developed and implemented its "stabilization" initiative as a means of quickly addressing immediate risks posed by releases until long term solutions can be applied. To improve the efficiency of environmental restoration at its facilities, DOE is developing guidance and training programs on accelerated environmental restoration under RCRA. A RCRA guidance document, entitled "Accelerating RCRA Corrective Action at DOE Facilities," is currently being developed by DOE's Office of Environmental Policy and Assistance. The new guidance document will outline a decision-making process for determining if acceleration is appropriate for individual facilities, for identifying, evaluating, and selecting options for program acceleration, and for implementing selected acceleration options. The document will also discuss management and planning strategies that provide a firm foundation for accelerating RCRA corrective action. These strategies include a number of very basic principles that have proven effective at DOE and other federal facilities, as well as some new approaches. The purpose of this paper is to introduce DOE's new guidance document, discuss the general approach presented in the guidance for accelerating RCRA corrective action, and to emphasize some of the more important principles of effective management and planning.

15646 (CONF-950216–120) **An expert system for enhancing compliance with hazardous materials packaging and transportation regulations.** Ferrada, J.J. (Oak Ridge National Lab., TN (United States)); Michelhaugh, R.D.; Pope, R.B.; Rawl, R.R.; Thomas, T.M. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995. Order Number DE95010284. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Material Expert System (HaMTES) was developed at ORNL in order to provide a computerized expert system which is easy to use, will provide straightforward and consistent application of the hazardous material transportation regulations, and will reduce the potential for human error in applying the regulations to both packaging and transportation of hazardous material activities. The system's proof-of-concept was demonstrated using the radioactive material regulations and then expanded to include regulations for all hazardous materials. It incorporates as much as possible multi-media capabilities, for accessing A/V demonstrations of explanations and applications of regulations, descriptions of package designs, and actual loading and preparation for shipment of specific package designs. Coupling of HaMTES to other transportation operations management software is underway and methods for maintaining and upgrading the program developed. Details of the capabilities of HaMTES, its computer hardware requirements, and plans for implementing HaMTES within the DOE shipping community are presented in this paper.

15647 (DOE/EA–1026) **Environmental Assessment for the sewage lagoon system: Area 5, Nevada Test Site.** USDOE Nevada Operations Office, Las Vegas, NV (United States). Feb 1995. 22p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009936. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Nevada Operations Office prepared an environmental assessment (EA), (DOE/EA-1026), to evaluate the potential impacts of constructing a sanitary waste sewage lagoon system in Area 5 at the Nevada Test Site (NTS). The proposed system would replace an existing septic system. Based on the information and analyses in the EA, DOE has determined that the proposed action would not constitute a major federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 (42 USC 4321 et seq.). Therefore, an environmental impact statement (EIS) is not required and DOE is issuing this FONSI.

15648 (DOE/EA–1032) **Environmental assessment for the upgrade of the site road infrastructure on the Savannah River Site.** USDOE Savannah River Operations Office, Aiken, SC (United States). Feb 1995. 21p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009935. Source: OSTI; NTIS; INIS; GPO Dep.

Four of the 17 bridges at the SRS need to be replaced. Principal impact of the proposed action would be the loss of 0.3 ha of wetland area and potential for erosion/sediment transport into SRS streams and waterways, although the latter would be minimized. A floodplain/wetlands assessment was prepared in compliance with 10 CFR Part 1022 and Executive Order 11990 for wetland protection. DOE has determined that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment with the meaning of NEPA; therefore, an environmental impact statement is not required and DOE is issuing this FONSI and Floodplain Statement of Findings.

15649 (DOE/EA–1046) **Environmental assessment for the construction, operation, and closure of the solid waste landfill at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky.** USDOE Oak Ridge Operations Office, TN (United States). Mar 1995. 55p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009931. Source: OSTI; NTIS; INIS; GPO Dep.

DOE has prepared an environmental assessment (EA) for the proposed construction, operation, and closure of a Solid Waste Landfill (SWL) that would be designed in accordance with Commonwealth of Kentucky landfill regulations (401 Kentucky Administrative Regulations Chapters 47 and 48 and Kentucky Revised Statutes 224.855). PGDP produces approximately 7,200 cubic yards per year of non-hazardous, non-radioactive solid waste currently being disposed of in a transitional contained (residential) landfill cell (Cell No. 3). New Kentucky landfill regulations mandate that all existing landfills be upgraded to meet the requirements of the new regulations or stop receiving wastes by June 30, 1995. Cell No. 3 must stop receiving wastes at that time and be closed and capped within 180 days after final receipt of wastes. The proposed SWL would occupy 25 acres of a 60-acre site immediately north of the existing PGDP landfill (Cell No. 3). The EA evaluated the potential environmental consequences of the proposed action and reasonable alternative actions. Based on the analysis in the EA, DOE has determined that the proposed action does not constitute a major Federal action which will significantly affect the human environment within the meaning of the National Environmental Policy Act of 1969 (NEPA), 42 USC 4321 et seq. Therefore, it is determined that an environmental impact statement will not be prepared, and DOE is issuing this FONSI.

15650 (DOE/ER/61721–1) **Integrative assessment of mitigation, impacts, and adaptation to climate change.** Nakicenovic, N. (ed.) (International Inst. for Applied Systems Analysis, Laxenburg (Austria)); Nordhaus, W.D. (ed.); Richels, R. (ed.); Toth, F.L. (ed.). International Inst. for Applied Systems Analysis, Laxenburg (Austria). May 1994. 661p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States);National Science Foundation, Washington, DC (United States);Yale Univ., New Haven, CT (United States);International Inst. for Applied Systems A DOE Contract FG02-93ER61721. (CONF-9310415–: Integrative assessment of mitigation, impacts, and adaptation to climate change, Laxenburg (Austria), 13-15 Oct 1993; CP–94-9). Order Number DE95008168. Source: OSTI; NTIS; GPO Dep.

The Intergovernmental Panel on Climate Change (IPCC), representing the analysts who perform the assessments and the political system which commissions them, together with the International Institute for Applied Systems Analysis (ITASA), organized the first international workshop to focus on the comparative assessment of mitigation of climate change and on its potential impacts and adaptation strategies (1–2 September 1992). One of the key findings of this workshop was the need for integrated assessment. Numerous models and less formalized approaches analyze anthropogenic sources of greenhouse gas emissions, their concentrations in the atmosphere, the resulting climate forcing, impacts of the induced climate change on the economy and other human activities, as well as possible mitigation and adaptation strategies. Studies that include all or several of these salient aspects of the climate change problem are known as integrated assessments. Subsequently, IPCC included integrated assessment in its Working Group III that deals with economic questions and cross-cutting issues. One year after the first workshop IIASA convened a second workshop (13–15 October 1993), specifically to review the current practice of integrated assessments, directions for improvement and further research, and implications for climate change policies. This volume presents the proceedings of the 1993 workshop. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

15651 (DOE/PC/94227–T2) **Environmental impacts of ocean disposal of CO_2. 2nd quarterly report, October 1, 1994–December 31, 1994.** Tester, J.W.; Adams, E.E. Massachusetts Inst. of Tech., Cambridge, MA (United States). Energy Lab. [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94227. Order Number DE95010363. Source: OSTI; NTIS; GPO Dep.

This report summarizes progress in considering the environmental impacts of marine disposal of carbon dioxide. Calculations are being subcontracted to SAIC. In addition, administrative aspects of the project are discussed and technical presentations in the last quarter are summarized.

15652 (FEMP–2401) **CERCLA and RCRA requirements affecting cleanup of a hazardous waste management unit at a Superfund site: A case study.** Walsh, T.J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Mar 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950646–13: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95009553. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP) attempted to address both RCRA and CERCLA requirements at the fire training facility (FTF) by integrating a CERCLA removal action work plan with a RCRA closure plan. While the regulatory agencies involved with the FTF cleanup agreed the integrated document was a good idea, implementation proved complicated, owing to

disposition of clean debris from a Superfund site, treatment of contaminated media, duration of cleanup activities, and cleanup certification. While all the complications have not been resolved, solutions to all have been proposed to Ohio EPA and U.S. EPA. Both agencies have worked closely with FEMP to find the most effective fulfillment of RCRA and CERCLA requirements.

15653 (IEE-SR–257) **Economical analysis relating to the global warming issue.** Institute of Energy Economics, Tokyo (Japan). Aug 1994. 220p. (In Japanese). Order Number DE95764072. Source: OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan.

An analysis using global macro economic models is conducted on how to think and cope with the global warming issue from political and economic aspects. As viewpoints of evaluation, cited are cost estimation for the CO2 emission control, damage caused by the global warming and its economic evaluation, and the catastrophic effects on the ecosystem except the economic evaluation. Cline says that maximum efforts should be exerted to suppress CO2 emission to the level of 1990 by the year of 2000. It is said that to confirm how serious greenhouse effects will be in 2000, it is necessary to concentrate on scientific researches, and that the international society should make its second-stage determination in terms of freezing or reducing the level of 2000, or admitting that the level will go upward. For this, the economic distortion should be removed by removing assistance to fossil fuels step by step. Assistance to developing countries and economical efficiency should be raised by introducing the carbon tax. Improvement of efficiency and arrangement of incentives are required for individual technologies. Measures for forest preservation are necessary under the financial assistance program, etc. 34 figs., 36 tabs.

15654 (IMFUFA–291) **1. annual report from the project life-cycle analysis of the total Danish energy system. An example of using methods developed for the OECD/IEA and the US/EU fuel cycle externality study.** Soerensen, B. Roskilde Universitetscenter (Denmark). Inst. for Studiet af Matematik og Fysik samt deres Funktioner i Udervisning, Forsning og Anvendelser. 1995. 96p. Contract ENS-1753/94-0001. Order Number DE95766518. Source: OSTI; NTIS.

EFP-94.

The aim of the project is to identify the state of art as regards life-cycle analysis of energy systems and to apply it to the current Danish energy system as well as to two scenarios for mid-21st century energy systems. Work has concentrated on identifying the scenarios to be explored, and on collecting the externality data from the European Union (EU) project and other sources, with a view to their applicability under Danish conditions. During 1995, it is expected that further impact data will be gathered, and that the scenarios will be tested by simulation models, in order to ascertain their internal consistency. A brief outline of the work performed in 1994 is given in addition to an account of the life-cycle method and presentation of key results of externality studies abroad and in Denmark, with emphasis on the 'ExternE' results related to the coal, nuclear and wind cycles. The scenarios selected for the Danish application are presented, based on work performed for the Danish Technology Council. A conference paper containing presentation of the renewable energy scenario of the Danish Technology Council is included. (AB)

15655 (LA-UR–95-187) **Reaction chemistry of nitrogen species in hydrothermal systems: Simple reactions, waste simulants, and actual wastes.** Dell'Orco, P.; Luan, L.; Proesmans, P.; Wilmanns, E. Los Alamos National Lab., NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950284–2: 1. international workshop on supercritical water oxidation, Jackson, FL (United States), 6-9 Feb 1995). Order Number DE95006328. Source: OSTI; NTIS; INIS; GPO Dep.

Results are presented from hydrothermal reaction systems containing organic components, nitrogen components, and an oxidant. Reaction chemistry observed in simple systems and in simple waste simulants is used to develop a model which presents global nitrogen chemistry in these reactive systems. The global reaction path suggested is then compared with results obtained for the treatment of an actual waste stream containing only C-N-0-H species.

15656 (NEDO-GET–9306) **Investigations on trends in research and development on global environmental problem technologies at universities and other organizations.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 296p. (In Japanese). Order Number DE95769807. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

With an objective to effectively promote the research and development on global environment industrial technologies, investigations have been carried out on research and development activities at universities and national research institutes. The investigations were carried out by referring to and collecting literatures published by Japan Information Center of Science and Technology, theses announced by academic and industrial societies, and annual reports of research institutes. In relation to the global warming problem, technologies and researches using influence estimation by means of carbon circulation models were as many as accounting for about 40% of the total references. A large number of researches on preventive measures are carried out at universities, such as CO2 fixation. Also academic and theoretical researches are seen in a great number as represented by simulations for elucidating warming mechanisms. In the national research organizations, water-quality and soil maintenance technology accounts for 20% of the whole research, and researches are active on waste water treatment and harmful substance treatment by means of biological technologies. Reduction of NOx emission from diesel engines and refuse disposing technologies are also included in the researches. The possibility of new seeds includes CO2 fixation by using CO2 separating membranes and reactive electrodes, removal of air pollutants through photo-catalysts, and decomposition of harmful substances by means of catalysts and microorganisms. 10 refs., 11 figs., 25 tabs.

15657 (NEDO-GET–9308) **Technical innovation for reducing emissions of greenhouse effect gas and survey of effects of changes of industrial structures.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 245p. (In Japanese). Order Number DE95769808. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The paper evaluates energy utilization efficiency and recycling potential in the industrial sector. Energy conservation in the commercial/residential sector is effective for improvement of energy efficiency of space heating and cooling. In the business sector, heat insulated structure of buildings is increasing, as well as increasing efficiency of heating facilities. In the passenger sector, energy conservation of automobiles is increasing. In the iron and steel industry, energy conservation of 20% was achieved. However, future recovery of exhaust energy needs technical development. The cement industry treats waste from other industrial sectors, aiming at energy conservation. Energy conservation in the petrochemical industry is mainly a combination of process rationalization and increasing of production ability. The electric utility industry tackles the energy conservation issue from the supply/demand aspect. In the town gas industry, energy conservation is promoted by improvement of energy conversion efficiency and utilization of LNG cold energy. For reference, attached are reports of the Intergovernmental Panel on Climate Change (IPCC). 50 figs., 17 tabs.

15658 (NEI-DK–1910) **Environmental economics and the Baltic region.** Birk Mortensen, J. (ed.). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. 170p. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). Order Number DE95766547. Source: OSTI; NTIS; INIS.

This volume originates from a workshop on Economics of the Environment held at the Institute of Economics, Copenhagen University, November 14-15, 1990 with participants from Lithuania, Estonia, Poland, Finland, Sweden and Denmark. The volume contains the papers presented at the workshop. In all the countries around the Baltic Sea there has been an increasing understainding

of the importance of using the economic incentive approach to reach environmental goals. By changing the incentives an individual producer or consumer faces, the best private choice can be made to coincide with the best social choice. All the countries around the Baltic Sea have used direct regulation or command and control in environment regulation. Growing concern about environmental degradation, dissatisfaction with the command and control approach and the need to extend environmental regulation to sectors with a large number of small producers or consumers have increased attention to economic instruments in environmental policy. The Baltic sea is an almost coherent ecological system and there is a growing interest in addressing common environmental problems among the countries around the Baltic Sea. The recent political development offer new possibilites for cooperation in environmental policy. This is important because many environmental problems in the region require solutions involving several countries. (EG)

15659 (NEI-DK–1910, pp. 63-69) **Environmental policy - a Baltic perspective.** Raju, O. (Tartu University, Department of Economics, Tartu (Estonia)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

It is common knowledge that the environmental policy of a country must proceed from the current political and economic situation. At present, the three Baltic states striving to regain their independence are in a rather complicated condition both economically and politically, as well as ecologically. Owing to that, the application of any definite environmental policy is impeded. At the same time, quick and efficient measures are badly needed in order to improve matters thoroughly in a considerably short period. In what follows we shall mostly confine ourselves to Estonia, however, the most important problems being similar in all the Baltic republics, we shall at times take a glance at Latvia and Lithuania, too. (au)

15660 (NEI-DK–1910, pp. 111-119) **Public participation in water management planning.** Kosola, M. (National Board of Waters and Environment, Helsinki (Finland)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

National Board of Waters and Environment is responsible for comprehensive planning of water resources management, water pollution control, combating of oil spills, development of flood control and sewage systems, promotion of the recreational use of water bodies and, for monitoring, supervision and research concerning Finland's national water resources. Water pollution problems in the area are caused by non-point sources as agriculture, forestry and fur production. This is mainly because of the utilization of certain fertilizers as well as loading caused by the fur production. Forest drainage, acidification as well as careless storage of fur production wastes and destroying them cause pollution problems, too. A more recent approach to water pollution control planning includes the use on non-aggregative methods. Here, different types of effects on the social and cultural environment, the physical environment and nature in the area are to be taken into consideration, not so that they are converted to money but in their respective dimensions. (EG)

15661 (NEI-DK–1910, pp. 122-134) **Changing from cleaning technology to cleaner technology.** Georg, S. (The Copenhagen School of Economics and Business Administration, Inst. of Transport, Tourism and Regional Economics (Denmark)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

In a number of Western European countries more and more attention is being given to the development and diffusion of cleaner technologies, because attempts to treat and dilute our way out of many pollution problems have not proven to be satisfactory solutions. Compared to the situation in the Baltic and other Eastern European countries, where industry does little, if anything at all to reduce pollution, the environmental problems facing Denmark may seem minuscule, and the concept of cleaner technology somewhat farfetched. However, in light of the growing concern for the environment and the budding attempts to protect the environment in Eastern Europe, there is no reason why these countries should make the same 'mistakes' as the Western European countries by choosing to treat rather than prevent the environmental problems. The concept of cleaner technology is presented in more detail. The endeavours of the Danish government to promote cleaner technology are presented and discussed in the following section, with special attention being given to the results of 'The Cleaner Technology programme' (1986-89). (EG)

15662 (NEI-DK–1910, pp. 151-170) **Pollution taxes and international competitiveness.** Birch Soerensen, P. (Copenhagen Business School, Institute of Economics, Copenhagen (Denmark)). Copenhagen Univ. (Denmark). Oekonomisk Inst. Mar 1994. (CONF-9011345–: Workshop on economics of the environment, Copenhagen (Denmark), 14-15 Nov 1990). In *Environmental economics and the Baltic region.* 170p. Order Number DE95766547. Source: OSTI; NTIS.

Throughout the industrialized world policy makers are becoming increasingly aware of the potential gains in economic efficiency and environmental quality to be reaped in certain areas of pollution control by switching from direct regulation to market-oriented policy instruments such as pollution taxes. However, concern about the impact on the international competitiveness of domestic producers seems to make governments in many countries hesitant to introduce pollution taxes. As a result, several observers have called for international agreements on harmonized pollution taxes among larger groups of countries such as the member states of the European Community. This paper argues that policy makers should be less concerned about the effects of pollution taxes on international competitiveness and more conscious about their effects on economic efficiency and equity. If pollution taxes improve the allocation of resources, it would be possible to compensate those citizens who might lose from their introduction and still leave the rest of society better off. The openness of the economy only means that a given improvement of environmental quality can be achieved through a lower level of pollution tax rates than would be necessary in a closed economy, because a given pollution tax rate will cause a greater contraction of output in polluting industries, the more these industries are exposed to foreign competition. (EG)

15663 (NEI-NO–494) **Energy strategies for the world. A case for international cooperation.** Brundtland, G.H. Norsk Petroleumsforening, Oslo (Norway). 1994. 5p. (CONF-9408229–1: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766570. Source: OSTI; NTIS; INIS.

The conference paper deals with policy aspects on environmental protection. The conclusion of the paper goes on the cooperation between the Government and industry to lay the foundation for a common, cooperative energy future. To achieve security of energy supplies and environmental protection, there is a need of developing stable market and framework conditions. According to the author, a good example is development of gas where long term commercial relations are needed to develop production and markets. This should also be acknowledged by governments in their policy making.

15664 (NEI-NO–495) **Trends and changes in the European energy situation.** Adam, G. Norsk Petroleumsforening, Oslo (Norway). 1994. 7p. (CONF-9408229–2: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766571. Source: OSTI; NTIS; INIS.

The conference paper gives a summary of the energy policy in Europe with the focus on trends and changes in the energy situation. Aspects discussed in this paper are energy and society, energy demand, policy issues, the European response, and the European Energy Charter.

15665 (NRRI–92-17) **Regulatory policy issues and the Clean Air Act: An interim report on the state implementation workshops.** Rose, K.; Burns, R.E. National Regulatory Research Inst., Columbus, OH (United States). Aug 1992. 81p. Sponsored by

USDOE, Washington, DC (United States);National Regulatory Research Inst., Columbus, OH (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract AI01-92PE10021. (CONF-9303334–Summ.: Regulatory policy issues and the clean air act workshop; Regulatory policy issues and the clean air act workshop; Regulatory policy issues and the clean air act workshop; Regulatory policy issues and the clean air act workshop, Albuquerq Order Number DE95008740. Source: OSTI; NTIS; GPO Dep.

The National Regulatory Research Institute (NRRI), with funding from the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE), conducted two workshops on state public utility commission implementation of the Clean Air Act Amendments of 1990 (CAAA). The first workshop was held in Charlotte, North Carolina for southern and eastern states in April 1992 and the second was held in St. Louis, Missouri for Midwestern states in May. The workshops had four objectives: (1) discuss key issues and concerns on CAAA implementation, (2) encourage a discussion among states on issues of common interest, (3) attempt to reach consensus, where possible, on some key issues, and (4) provide the workshop participants with information and materials to assist in developing rules, orders, and procedures in their state. Of primary interest from the federal perspective was for workshop participants to return to their states with additional background and understanding of how state commission actions may affect implementation of the CAAA and enable them to provide guidance to their jurisdictional utilities. It was hoped this would reduce some of the uncertainty utilities face and assist in the development of an efficient allowance market. The basic format of the workshops was that invited speakers made presentations on specific issues. "Primary participants" from each state and other workshop attendees then discussed the issues raised by the speakers and other related concerns. The primary participants were state commissioners, commission staff, representatives from state consumer advocate organizations, EPA, DOE, and the Federal Energy Regulatory Commission (FERC). Other attendees were utility representatives, consultants, and other interested parties. All participants were given a workbook with excerpts from an NRRI report on CAAA implementation and papers or outlines from speakers.

15666 (SAND–95-0563C) **Summary of the energy efficient, waste-reducing technology assessment conducted for DOE and EPAct 2108.** Weinbrecht, E. (Sandia National Labs., Albuquerque, NM (United States)); Zachritz, W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503119–3: ECM '95 conference, Las Cruces, NM (United States), 12-15 Mar 1995). Order Number DE95009561. Source: OSTI; NTIS; GPO Dep.

The industrial sector is the most complex and diverse segment of the US economy. There are more than 360,000 industrial facilities in the US, using tens of thousands of processes with millions of different pieces of equipment and employing nearly 30 million people to make hundreds of thousands of products. These facilities consume large quantities of raw materials and energy resources every year. Their waste streams, as well as the technology options for preventing them, are very specific not only to individual industries, but even to plants within the same industry that produce similar products. On October 24, 1992, President Bush signed the Energy Policy Act of 1992 (EPAct) into law as Public Law 102-486. Section 2108 of the Act requires the DOE to identify opportunities to demonstrate energy efficient pollution prevention technologies and processes. As a first step in DOE's response to congress, Sandia National Laboratories lead a fast tracked project to compile information from the open literature, and pilot a process for identifying and prioritizing opportunity areas from industrial and federal experts. Approximately 300 documents were collected and reviewed, and knowledgeable individuals in government, universities, and trade associations were interviewed. A panel of experts from petroleum industry was assembled for the future opportunity assessments pilot These activities were conducted between May and August, 1993. Project background and results are summarized.

15667 (SAND–95-0570C) **Benefits of improved environmental cooperation on a joint DoD/DOE facility.** Pratt, G.K. (Tetra Tech, Inc., Albuquerque, NM (United States)); Gibson, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950451–1: 21. national environmental symposium and exhibition, San Diego, CA (United States), 17-21 Apr 1995). Order Number DE95009584. Source: OSTI; NTIS; INIS; GPO Dep.

Numerous Federal facilities within the US involve multiple government agencies that face overlapping environmental concerns. This paper highlights the benefits of looking beyond the strict letter of environmental regulations that might affect a single tenant or environmental site to cooperative environmental efforts that focus on the entire facility, consistent with the missions of participating agencies. Using Kirtland Air Force Base (AFB) as a model, seven areas of Department of Defense (DoD) and Department of Energy (DOE) environmental cooperation are discussed that span technical, regulatory compliance, and administrative issues.

15668 (UCRL-JC–118798) **Bite the apple, get driven out of the garden: A risky story telling at the ASME town meeting.** Majumdar, K.C. Lawrence Livermore National Lab., CA (United States). Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950740–12: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95008074. Source: OSTI; NTIS; INIS; GPO Dep.

Risk, the all-encompassing four-letter word became a widely used household cliche and an institutional mantra in the nineties. Risk analysis models from the Garden of Eden to the Capitol Hill lawn have made a number of sharp paradigm shifts to evolve itself as a decision-making tool from individual risk perception to societal risk-based regulatory media. Risk always coexists with benefit and is arbitrated by costs. Risk-benefit analysis has been in use in business and industry in economic ventures for a long time. Only recently risk management in its current state of development, evolved as a regulatory tool for controlling large technological systems that have potential impacts on the health and safety of the public and on the sustainability of the ecology and the environment. This paper summarizes the evolution of the risk management concepts and models in industry and the regulatory agencies in the US over the last three decades. It also discusses the benefits and limitations of this evolving discipline as it is applied to high-risk technologies from the nuclear power plant and petrochemical industry, etc. to nuclear weapons technology.

15669 (WHC-SD-GN-PMP–20004) **QUEST2: Release 1: Project plan deliverable set.** Braaten, F.D. Westinghouse Hanford Co., Richland, WA (United States). 10 Feb 1995. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008803. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Management Plan combines the project management deliverables from the P+ methodology which are applicable to Release 1 of the QUEST2 work. This consolidation reflects discussions with WHC QA regarding an appropriate method for ensuring that P+ deliverables fulfill the intent of WHC-CM-3-10 and QR-19.

2904 Energy Resources

Refer also to citation(s) 14767

15670 (CRIE-Y–94001) **World energy resources. Endowments, supply/demand, economics, and related technology development.** Yamaji, K. (Central Research Institute of Electric Power Industry, Tokyo (Japan)); Okada, K.; Nagano, K.; Imamura, E.; Nagata, Y.; Yamamoto, H.; Sugiyama, T.; Honda, H. Central Research Inst. of Electric Power Industry, Tokyo (Japan). Jun 1994. 73p. (In Japanese). Order Number DE95769743. Source: OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan.

The latest information investigations and discussions were given on worldwide endowments, supply/demand, and prices of different energy resources. The energy resources as the objects of the

discussions included petroleum, coal, natural gas, nuclear fuel, biomass, hydropower, underground heat, wind power, and solar energy. Information and data on their mass, prices, and related technologies were put into systematic orders. The confirmed reserves of fossil fuel and nuclear fuel resources can take care of the current production for more than 40 years, and no shortage in the near future was forecast. With respect to evaluating the external economic cost for the use of energy resources, main discussion points on the externality were put into order and considered. An example of the evaluation performed in England was introduced. However, it was indicated that the evaluation result accompanied high uncertainty. In a long-term world energy demand prospect, demands from 18 to 41 billion tons are estimated in the year 2100 as converted into petroleum. Necessity for the principal energy that can substitute for petroleum was described. 89 refs., 18 figs., 47 tabs.

15671 (DOE/GO–10095-019) **Program Plan for Renewable Energy generation of electricity. Response to Section 2111 of the Energy Policy Act of 1992.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Dec 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94011856. Source: OSTI; NTIS; GPO Dep.

A 5-Year Program Plan for providing cost-effective options for generating electricity from renewable energy sources is presented by the US Department of Energy Office of Energy Efficiency and Renewable Energy. The document covers the Utility-Sector situation, scope of the program, specific generating technologies, and implementation of the program plan.

2905 Research, Development, Demonstration, and Commercialization

Refer also to citation(s) 14797, 14825, 15237, 15307, 15313, 15642, 15656, 15666, 15702, 15730, 15755, 15777, 15779, 16299, 17387

15672 (DOE/ER/75633–T3) **Technology Transfer Demonstration Project. Final report, September 1991–June 1994.** Rural Enterprises, Inc., Durant, OK (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91ER75633. Order Number DE95010180. Source: OSTI; NTIS; GPO Dep.

Rural Enterprises, Inc. (REI) and the Rural Technology Applications Team (RTAT) submit this final report in support of the scopes of work for the Department of Energy. It covers significant activities occurring during September 1991 to June 1994. Through RTAT, Rural Enterprises, Inc. acts as a technology transfer agent between individuals, businesses and local governments with technical problems, and the sources of technology available to solve these problems. REI's professional technology transfer team regularly evaluates developments intechnological innovations and data from many sources, seeking to match them with prospective users of that technology. The DOE's assistance is crucial in the creation of new and long-term private sector jobs in an area of economic depression and underemployment.

15673 (LA-UR–95-1104) **Forging strategic partnerships with industry: The Industrial Fellows Program.** Adams, K.; Castain, R.; Hynes, M.V.; Sanders, V.; Siemon, R.; Tellier, A.; Tiedman, A.; Umbarger, J.; Wilson, M. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9507101–1: Technology Transfer Society annual conference, Washington, DC (United States), Jul 1995). Order Number DE95009490. Source: OSTI; NTIS; GPO Dep.

Science, technology, and industrial policy are at an important nexus due to long developing trends in the national and international economy and recent events in national security affairs. The research and development assets built by the American taxpayer in response to the Cold War face a quest for relevance in the new era. National competitiveness in international markets has emerged as an important new priority. To better understand the perspective of US industry the management of the Los Alamos National Laboratory has initiated an Industrial Fellows Program which has placed six individuals at US corporations. Their goal is to create strategic partnerships through increased understanding of technical needs of industry and the technical capabilities of the Laboratory.

15674 (NEDO-GET–9310-3) **Project of promoting developments of innovative technology for the earth. International research exchange project.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 288p. (In Japanese). Order Number DE95769802. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

This paper describes research and development activities on solving global environmental problems, directed to creating new research regions and structuring technological systems, being performed by the Research Institute of Innovative Technology for the Earth (RITE) during fiscal 1993. In the invitational projects for overseas researchers, with an intention of executing research exchanges in wide areas between overseas researchers and Japanese researchers who are carrying out advanced researches on global environment related technologies, seven researchers were invited from different countries to implement joint researches. At the same time, twelve researchers in European countries and the U.S.A. were invited to the international vegetation science conference, the global environmental problem seminar, and the plant molecular physiology lecture meeting. With an objective of effectively promoting the researches done by Japanese researchers and identifying the trends in overseas research and development activities, six researchers were sent to universities and research institutes in Europe and America. Seven researchers were also sent to international conferences and symposiums on global environment related technologies. The major themes included carbonate fixation by plants through their photosynthesis, CO2 chemistry, and hydrogen energy development at IEA. 58 refs., 77 figs., 12 tabs.

15675 (NEDO-P–93-57) **Feasibility survey on international cooperation for high efficiency energy conversion technology in fiscal 1993.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 149p. (In Japanese). Order Number DE95769804. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Following cooperative researches on fuel cell jointly conducted by NEDO and EGAT (Electricity Generating Authority of Thailand), the survey on international cooperation relating to high efficiency energy conversion technology was carried out for the ASEAN countries. The paper summed up the results of the survey. The study of the international cooperation is made for the following three items: a program for periodical exchange of information with EGAT, a project for cooperative research on phosphoric acid fuel cell in Indonesia, and a project for cooperative research with EGAT on electric power storage by advanced battery. In Malaysia, which is small in scale of state, part of the Ministry of Energy, Telecommunication and Posts is only in charge of the energy issue. Therefore, the situation is that they cannot answer well to many items of research/development cooperation brought in from Japan. The item of medium- and long-term developmental research in the Philippines is about the problems which are seen subsequently in the Manila metropolitan area where the problem of outage is being settled. Accordingly, it is essential to promote the cooperative research, well confirming policies and systems of the Ministry of Energy and the national electricity corporation. 12 figs., 17 tabs.

15676 (NEI-DK–1899) **Financial assistance to environmentally protective activities in Eastern and Central Europe. Annual report for 1993.** Miljoestyrelsen, Copenhagen (Denmark). 1994. 65p. (In Danish). Order Number DE95766489. Source: OSTI; NTIS.

Details are given on the scope and character of Danish financial assistance given to projects aimed at improving the condition of the environment within Eastern and Central Europe during 1993 and comments are given on political aspects by the Chairman of the Advisory Committee for the environment-support setup (which

ranges under the Danish government) who is a well-known Danish journalist specializing in these regions. Information on legal aspects are included and also on various related conferences that have taken place during this period. The Danish Ministry of the Environment received 172 applications from Danish organizations wishing to carry out environmentally improving projects, and 69 of these were answered positively so that the total amount of financial assistance amounted to 189.0 million Danish kroner. The projects which were successful in receiving subsidies are described in detail, and those responsible for them are named in each case. The projects concern technology transfer and also such subjects as the preservation of the marshes in Estonia, the establishment of a society for the protection of birds and the improvement of hospital waste management in Poland. (AB)

15677 (ORNL–6842) **Physics Division progress report for period ending September 30, 1994.** Ball, S.J. (ed.). Oak Ridge National Lab., TN (United States). Apr 1995. 375p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95010498. Source: OSTI; NTIS; INIS; GPO Dep.

This report covers the research and development activities of the Physics Division for the 1993 and 1994 fiscal years, beginning October 1, 1992, and ending September 30, 1994. The activities of this Division continue to be concentrated in the areas of experimental nuclear physics, experimental atomic physics, and theoretical nuclear and atomic physics. In addition, there are smaller programs in particle physics, plasma diagnostics, and data compilation and evaluation. A new program in nuclear astrophysics has been initiated to take advantage of the forthcoming radioactive ion beams from the reconfigured Holifield Facility. During this two-year reporting period, the Holifield Facility has been undergoing a rebirth as a radioactive ion beam facility. The facility is on budget and on schedule toward a first beam delivery date of August 31, 1995.

15678 (PNL–10519-1) **AMTEX first quarter FY95 report.** Pacific Northwest Lab., Richland, WA (United States). Dec 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010547. Source: OSTI; NTIS; GPO Dep.

The AMTEX Partnership™ is a collaborative research and development program among the US Integrated Textile Industry, the Department of Energy (DOE), the national laboratories, other federal agencies and laboratories, and universities. The goal of AMTEX is to strengthen the competitiveness of this vital industry, thereby preserving and creating US jobs.

15679 (RISO-R–800(EN)) **Systems Analysis Department annual progress report 1994.** Larsen, H.; Petersen, K.E. (eds.). Risoe National Lab., Roskilde (Denmark). Systems Analysis. Mar 1995. 76p. Order Number DE95766440. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The report describes the work of the Systems Analysis Department at Risoe National Laboratory during 1994. The department is made up of the Cognitive Systems Group, the Risk Analysis Group, the Energy Systems Group, and the UNEP Collaborating Centre for Energy and Environment. The report includes lists of publications, lectures and staff members. (au)

15680 (UCRL–53868-94) **Engineering research, development and technology.** Lawrence Livermore National Lab., CA (United States). Feb 1995. 304p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010403. Source: OSTI; NTIS; GPO Dep.

The mission of the Engineering Research, Development, and Technology Program at Lawrence Livermore National Laboratory (LLNL) is to develop the technical staff, tools, and facilities needed to support current and future LLNL programs. Our efforts are guided by a dual-benefit research and development strategy that supports Department of Energy mission, such as national security through nuclear deterrence and economic competitiveness through partnerships with US industry.

15681 (UCRL-ID–119321) **National strategic challenges and the role of Lawrence Livermore National Laboratory.** Al-Ayat, R.A.; Chrzanowski, P.L.; Werne, R.W. Lawrence Livermore National Lab., CA (United States). Jan 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010208. Source: OSTI; NTIS; GPO Dep.

The end of the Cold War was a water-shed event in history–an event that calls for re-evaluation of the basic assumptions and priorities of US national security that have gone essentially unchallenged for nearly 50 years. Central to this re-evaluation are the changing needs for federal Science and Technology (S and T) investment to underpin national and economic security and the role of the Department of Energy (DOE) national laboratories in fulfilling those needs. The three nuclear weapons laboratories-Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratory (SNL)-are major constituents of DOE's national laboratory system. They helped win the Cold War, and will undoubtedly continue to support US security S and T requirements. This paper discusses of the role these three laboratories, and LLNL in particular, can play in supporting the nation's S and T priorities. The paper also highlights some of the changes that are necessary for the laboratories to effectively support the national S and T and economic competitiveness agenda. These issues are important to DOE and laboratory managers responsible for the development of strategic direction and implementation plans.

2906 Nuclear Energy

Refer also to citation(s) 14968, 15211, 15456, 15687, 16477

15682 (GRS–111) **International Nuclear Event Scale for reportable events in nuclear installations. User manual.** Kotthoff, K. Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS) mbH, Koeln (Gemany). Jun 1994. 138p. (In German). Order Number DE95769210. Source: OSTI; NTIS (US Sales Only); INIS.

The INES classification scale permits guided classification of events in nuclear installations by means of the clearly defined, international standard scale. It covers classes 0 through 7. It has been established in order to allow exchange of authentic information and data on nuclear accidents on an international level within short time, 24 hours. It also serves as a basis for information to the general public as to safety relevance of events occurred. The INES scale is applicable to characterising notifyable events that have occurred in civil nuclear installations, or events occurring during the transport of radioactive material to and from these installations. The scale has been established as a joint publication by the IAEA and NEA, and is subject to the supervision by the IAEA in its practical implementation. (HP)

15683 (INIS-BR–3490) **Nucleoelectric energy dilemma in Brazil in the 1980's.** Darella, M.D.P. Santa Catarina Univ., Florianopolis, SC (Brazil). Programa de Mestrado em Sociologia Politica. Nov 1989. 192p. (In Portuguese). Order Number DE95627061. Source: OSTI; NTIS (US Sales Only); INIS.

Production of electrical energy by nuclear reactors is unnecessary in Brazil. This option, which was concrete by the beginning of the 1970's, had its origins in the industrialized countries of the northern hemisphere. It signified a political ideological decision of an authoritarian and strategic nature, and not a technical scientific or ethical one. It began with the purchase of Angra 1 and was intensified in 1975, with the signing of the Brazilian-German Nuclear Agreement, establishing a double dependency: that of the nuclear reactors and that of combustion. The federal government was interested in the transference and command of technology, the production of electrical energy being secondary. Even through it was used as a justification for the country, the offer of electrical energy was already greater than the demand. In 1979, the Parallel Nuclear Program entered the scene. It was not subject to international inspections and was under exclusive control of the Armed Forces and the National Commission of Nuclear Energy, whose growing strength during the entire decade of the 1980's is notorious. At the same time, the Brazilian Nuclear Program lost in the 1980's the vitality that could be observed for the previous decade. It incurred accentuated technical errors and presented an extremely serious situation principally with regards to the emergency

plan for the population of Angra dos Reis and neighboring cities and for the disposal of radioactive residues, which continue without a solution or definitive place. It is concluded that it is not possible to proceed with a energy policy that subsidizes electrical energy - the least expensive in the world - preponderantly to the industrial sector, for the private national and trans national initiative. In this situation there is no room for thermonuclear energy, onerous to the public coffers and dangerous to the population, to the natural environment and to the entire Planet. (author). 217 refs, 1 fig, 17 tabs.

15684 (STUK-YTO-TR–74) **Review of psychological consequences of nuclear accidents and empirical study on peoples reactions to radiation protection activities in an imagined situation.** Haukkala, A. (Helsinki Univ. (Finland). Dept. of Social Psychology); Eraenen, L. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Oct 1994. 51p. (In Finnish). Order Number DE95627065. Source: OSTI; NTIS; INIS.

The report consist of two parts: a review of studies on psychological consequences of nuclear and radiation accidents in population and an empirical study of peoples reactions to protection actions in an event of hypothetical accident. Review is based on research results from two nuclear reactor accidents (Three Mile Island 1979, Chernobyl 1986) and a radiation accident in Goiania, Brazil 1987. (53 refs, 2 figs.,7 tabs.).

2907 Transport and Storage

15685 (NEI-NO–549) **Allocation metering of marginal fields. Requirements of Norwegian authorities.** Raustein, O. (Oljedirektoratet (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–56: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway). 23-26 Aug 1994). Order Number DE95766625. Source: OSTI; NTIS.

The conference paper deals with the requirements of Norwegian Authorities on multiphase flow technology. The paper discusses the existing regulations on multiphase flow metering by exemplifying the measuring techniques used on several offshore fields. The Authorities approach to measuring methods by new designed multiphase meters is included. 2 figs.

2908 Heat Utilization

Refer also to citation(s) 15714

15686 (ETDE-DE–76) **Subsequent installation of cogeneration units in existing heating station in the new federal states.** Joksch, H.O.; Mahfoud, S.; Schoebel, G.; Vossik, A.; Hannig, J. EWU Engineering GmbH, Berlin (Germany); Bundesministerium fuer Forschung und Technologie, Bonn (Germany). 1992. 21p. (In German). Foerderkennzeichen BMFT 0329298A. Order Number DE95769270. Source: OSTI; NTIS (US Sales Only).

While in condensing power plants an efficiency of about 40% can be attained for power generation this can be increased to 85% with combined heat and power generation in cogeneration plants. The primary aim is to find suitable technological solutions for existing heating stations with 6.5 t/h, 10 t/h and 40 t/h steam generators (pressure 1.3 MPa, superheater outlet temperature 220 C) in order to realize primary energy savings, an additional effective possibility to generate electric energy as well as a reduction of environmental loads and finally a competitive plant by retrofitting the plant with cogeneration units (steam turbines, gas turbines, combustion engines). The study aims at comparing the additional expenses on the one hand and the improvements, particularly the reduction of energy consumption and environmental loads, on the other. In order to solve this task for a number of varied conditions (fuel, steam parameters, circuit parameters) the resulting total costs from construction and operation of the heat-generating plant were determined for one heat unit and compared to each other. (orig.)

2910 Conservation

Refer also to citation(s) 15765, 15772

2920 Supply, Demand, and Forecasting

Refer also to citation(s) 15670, 15697, 15708, 15709, 15715

15687 (DOE/EIA–0204(95/01)) **EIA new releases: January–February 1995.** USDOE Energy Information Administration, Washington, DC (United States). Feb 1995. 28p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009301. Source: OSTI; NTIS; GPO Dep.

Major stories in this issue are: Major energy companies' strategies shift from growth to consolidation; Report assesses the oil and gas resources of Fergana Basin, Former Soviet Union; Natural gas wellhead prices expected to remain low in first half 1995; Reliability and the changing electric power industry; EIA updates reference on US coal; Decommissioning of US uranium production facilities examined by EIA; and Improved technology leads to lower energy price projections. The remaining part of the bulletin lists recent publications, including machine readable files, and contacts for energy data information.

15688 (DOE/EIA–M068-B/1) **Model documentation: Electricity Market Module. Modifications to the electricity capacity planning submodule.** USDOE Energy Information Administration, Washington, DC (United States). Energy Supply and Conversion Div. Apr 1995. 25p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010355. Source: OSTI; NTIS; GPO Dep.

The Electricity Market Module (EMM) is the electricity supply component of the National Energy Modeling System (NEMS). The EMM represents the generation, transmission, and pricing of electricity. It consists of four main submodules: Electricity Capacity Planning (ECP), Electricity Fuel Dispatching (EFD), Electricity Finance and Pricing (EFP), and Load and Demand-Side Management (LDSM). The ECP evaluates changes in the mix of generating capacity that are necessary to meet future demands for electricity and comply with environmental regulations. The EFD represents operating decisions and determines how to allocate available capacity to meet the current demand for electricity. Using investment expenditures from the ECP and operating costs from the EFD, the EFP calculates the price of electricity, accounting for state-level regulations involving the allocation of costs. The LDSM translates annual demands for electricity into distributions that describe hourly, seasonal, and time-of-day variations. These distributions are used by the EFD and the ECP to determine the quantity and types of generating capacity that are required to ensure reliable and economical supplies of electricity. The EMM also represents non-utility suppliers and interregional and international transmission and trade. The ECP uses a linear programming (LP) model to consider planning decisions involving changes in capital stock that occur over several years and require a substantial capital investment. It projects how the electric power industry will change its generating capability in response to changes in environmental regulations and increases in demand. The ECP has been modified for the Annual Energy Outlook 1995. Enhancements to the ECP include an endogenous representation of maintenance scheduling, the incorporation of technological optimism and learning factors, and a market-sharing algorithm.

15689 (IEE-SR–253) **Fiscal 1993 actual energy supply/demand and short-term prospect. Report of the energy supply/demand trend survey committee.** Institute of Energy Economics, Tokyo (Japan). Jun 1994. 120p. (In Japanese). Order Number DE95764070. Source: OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan.

The paper reports fiscal 1993 energy supply/demand trends in Japan. The domestic supply of the primary energy was 485,647 x 10^{10} kcal, 1.0% over 1992 indicating the same growth as in the previous year. By energy source, hydroelectric power showed a marked increase of 17.0% over last year. Nuclear power indicated a 14.0% growth over 1992, including four new power plants which started operation. As a result, all the primary power made a substantial rise of 14.9% over the preceding year. Coal increased 1.6%, helped by an increase in consumption of steam coal in power generation, with the starting operation of the new coal thermal power generation. Imports of petroleum products markedly

declined by 18.4% because of the continued shifting to domestic products. Natural gas showed almost the same level as in the previous year, a 0.6% increase, because of slow growth in power demand. The ultimate energy consumption was 336,120 x 10^{10} kcal, indicating a 1.0% increase. Energy consumption in the industrial sector was a 1.1% rise, despite of the business stagnation, and that in the residential sector a 3.3% rise. 35 figs., 73 tabs.

15690 (NEDO-NP–9321) **Survey for improving the supply and demand structure in private-sector energy use.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 289p. (In Japanese). Order Number DE95769800. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

For the purpose of rationalizing and energy-conserving use of private-sector energy utilized in buildings for residential houses and business, an investigational study is made for areas where the district air conditioning is introduced. As of the end of 1993, there are 112 business areas, 60% of which are especially in the Kanto area. As for business patterns of heat suppliers, the method of direct management by energy company covers half of all management types in the existing urban area rearrangement type. The method of private management dominates the industrial site utilization development type, and the third sector method is much adopted to the new town type. As energy source, the rate of conversion from petroleum to electricity is making an annual increase, and utilization of unused energy such as exhaust heat from refuse incineration and of exhaust heat from cogeneration is expedited. Energy efficiency which is a ratio of the fuel consumption amount (input) to the heat selling amount (output) is 1.05, 1.56 and 1.38 in medium-scale suburb-type redevelopment, large-scale resort development and small-scale urban-type redevelopment samples, respectively. The reason why the medium-scale suburb-type redevelopment is excellent in energy efficiency as 1.05 is well balance of heat demand and large effects of heat storage tanks and heat recovery turbo refrigerators.

15691 (NEDO-P–9334) **Investigations on the energy and infrastructural situations in China.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 36p. (In Japanese). Order Number DE95769805. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

While analyzing the current status and estimating the future development of the Chinese economy, this paper analyzes emphatically the nation's energy and infrastructure situations, and proposes the ways the Japan's economic cooperation to China should be. Amid the worldwide recession, the Chinese economy alone is enjoying the economic boom and making the foreign capital inflow a record high. However, China holds behind these optimistic scenes a large number of structural or short to medium and long term problems including inflation, commodity price hike, unemployment, shortage in infrastructures, and tightening energy supply. The nation is facing not an easy way in its future. In the transportation sector, the country has decisive shortage in facilities to handle the demands that will grow with the economic development. The energy problem is represented by limited supply capacity such as oil production hitting the ceiling, as well as that in coal production as a primary problem. The low energy efficiency is another example. Electric power shortage is also serious. Japan is required to cooperate with China also in the personnel training, and medical and cultural areas in addition to giving assistance to eliminate bottlenecks in the Chinese economy. It is also necessary to advocate symbolic cooperative projects by which the peoples of China will be endowed with benefits. 2 figs., 15 refs.

15692 (NEI-NO–496) **World economic development. The consequences for the energy sector.** Matsui, Ken-ichi (Energy Data and Modelling Center. Inst. of Energy Economics, Tokyo (Japan)). Norsk Petroleumsforening, Oslo (Norway). 1994. 9p. (CONF-9408229–3: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766572. Source: OSTI; NTIS.

The conference paper discusses the economic development and the growing energy demand worldwide. The attention is laid on the development in Asian countries and China in particular. According to the author, the influencing factors are the population growth, economic growth accompanied by the growing trade, rapid industrialization oriented for heavy and chemical products, rapid motorization, and the shift from non-commercial to commercial energy in the residential sector in Asian countries. 3 refs.

15693 (NEI-NO–497) **Norway as a reliable supplier of clean energy to Europe.** Stoltenberg, J. Norsk Petroleumsforening, Oslo (Norway). 1994. 6p. (CONF-9408229–4: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766573. Source: OSTI; NTIS.

The conference paper describes some of the Norwegian challenges regarding the supply of oil, gas, and electricity. The author points out some of the developments in the European Union (EU). These developments are of great importance due to their influence on the value of energy resources and the ability of energy supply. Topics are: Electricity - stronger links to Europe; developments and challenges in the petroleum sector covering future challenges and fiscal framework and taxes; EU energy policies; gas - clean energy to EU.

15694 (NEI-NO–498) **The changing role of CIS states in the energy market.** Vowinckel, G. (European Bank for Reconstruction and Development, London (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 16p. (CONF-9408229–5: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766574. Source: OSTI; NTIS.

The conference paper deals with the role of the European Bank for Reconstruction and Development (EBRD) on the stimulation of economic growth and public infrastructure projects in Central and Eastern Europe and in the former Soviet Union (CIS). The very specific task is to assist the transition process in these countries. An important mandate is to help their move towards economic reforms with the oil and gas industry as an essential part of it. Topics are: The oil and gas sector in the former CIS; oil and gas projects; project financing; investment climate; other investments; gas production and supply; Gazprom; transportation.

15695 (ORNL/CON–405) **Utility DSM Programs from 1989 through 1998: Continuation or cross roads?.** Hadley, S.; Hirst, E. Oak Ridge National Lab., TN (United States). Feb 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009064. Source: OSTI; NTIS; GPO Dep.

Over the past five years, the Energy Information Administration (EIA) has been collecting data annually from U.S. electric utilities on their demand-side management (DSM) programs, both current and projected. The latest data cover activities for 1993 and projections for 1994 and 1998. In 1993, 991 utilities operated DSM programs. That year, they spent $2.8 billion, a 13% increase over 1992 expenditures. These and earlier DSM programs saved 44,000 GWh of energy and reduced potential peak demand by 40,000 MW, 30% and 22% increases over the 1992 values, respectively. While some people predict the demise of electric-utility DSM programs, the data do not paint so bleak a picture. In most parts of the country, DSM programs grew in 1993 and utilities (as of Spring 1994) projected continued growth through 1998. Expenditures grew from 1.3% of revenues in 1992 to 1.5% in 1993, and are expected to grow 2.5% per year faster than inflation, which is equivalent to revenue growth. Thus, DSM spending is expected to stay constant at 1.5% of revenues through 1998. Because of the cumulative effect of DSM programs, energy savings are expected to grow from 1.2% of sales in 1992 to 1.6% in 1993 and 3.0% in 1998. Potential-peak reductions are expected to increase from 5.9% of peak demand in 1992 to 6.8% in 1993 and 8.9% in 1998. However, the growth in spending is not as rapid as the 8% annual real growth projected a year earlier. Actual expenditures in 1993 were 6.5% lower than projected early that year. Energy savings, on the other hand, were the same as projected earlier. Potential peak reductions were actually 9% higher than previously projected.

15696 (PNL-SA–25138) **Energy security in the post-Cold War era: Identifying future courses for crises.** Freund, M.T.; Wise, J.A.; Ulibarri, C.A.; Shaw, B.R.; Seely, H.E.; Roop, J.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9411212–1: Energy and national security in the 21st century conference, Washington, DC (United States), 10 Nov 1994). Order Number DE95007817. Source: OSTI; NTIS; GPO Dep.

This paper addresses US energy security in the post-Cold War era for a conference on energy security jointly sponsored by the Department of Energy and the National Defense University. It examines the evolving nature of energy security based on analysis of past crisis-inducing events and-discusses potentially important geopolitical, environmental, regulatory, and economic developments during the next twenty-five years. The paper steps beyond the traditional economic focus of energy security issues to examine the interplay between fundamental economic and technical drivers on the one hand, and political, environmental, and perceptual phenomena, on the other hand, that can combine to create crises where none were expected. The paper expands on the premise that the recent demise of the Soviet Union and other changing world conditions have created a new set of energy dynamics, and that it is imperative that the United States revise its energy security perspective accordingly. It proceeds by reviewing key factors that comprise the concepts of "energy security" and "energy crisis" and how they may fit into the new world energy security equation. The study also presents a series of crisis scenarios that could develop during the next twenty-five years, paying particular attention to mechanisms and linked crisis causes and responses. It concludes with a discussion of factors that may serve to warn analysts and decision makers of impending future crises conditions. The crisis scenarios contained in this report should be viewed only as a representative sample of the types of situations that could occur. They serve to illustrate the variety of factors that can coalesce to produce a "crisis."

2930 Policy, Legislation, and Regulation

Refer also to citation(s) 15196, 15667, 15770

15697 (BNL–61556) **US Least Cost Energy Strategy: Review and update.** Morris, S.C. Brookhaven National Lab., Upton, NY (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9409326–1: International Energy Agency Energy Technology systems analysis program workshop, Banff (Canada), 2-9 Sep 1994). Order Number DE95009547. Source: OSTI; NTIS; GPO Dep.

The Energy Policy Act of 1992 requires the US Department of Energy (DOE) to develop a Least Cost Energy Strategy to be updated on a regular basis. Social and environmental costs are to be considered in addition to direct energy costs. Partly because the emphasis was on a least-cost strategy, DOE selected MARKAL as the model to be used in the analysis. Brookhaven National Laboratory is assisting DOE in the following areas: data development, training, confidence building and illumination of model behavior, calibration, scenario development, model runs, interpretation of results, and documentation. The work began with an emphasis on MARKAL, but during the summer of 1994 a shift was made to MARKAL-MACRO.

15698 (DOE/BP–2186) **BPA statutes.** USDOE Bonneville Power Administration, Portland, OR (United States). Jan 1995. 120p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009165. Source: OSTI; NTIS; GPO Dep.

This publication includes the Bonneville Power Administration's (BPA) authorities. It combines the two previous booklets of BPA authorities' and adds: sections of certain Appropriation Acts affecting BPA; a list of all other Appropriation Acts affecting BPA; a list of the acts authorizing Federal hydroelectric dams in the Columbia River Basin; portions of the Energy Policy Act of 1992 that specifically apply to BPA; portions of the Federal Power Act to provide context for the Energy Policy Act. The laws are in their United States Code format, rather than in the Public Law format as passed. Thus, the citation for Bonneville Project Act section 2(f) is shown as 16 USC §832a(f). Most people are familiar with the Public Law citations, so they have been retained and appear in italics at the end of each paragraph. In addition, later amendments to earlier laws are reflected in the United States Code language. For example, the Preference Act's definition of "Pacific Northwest" (16 USC §837(b)) reflects the Northwest Power Act's amendment of that term. The laws are presented in the numerical order they appear in the United States Code, rather than in the order in which they became law. Therefore, the Energy Policy Act of 1992 is presented first. This booklet is not, nor is it intended to be, an official reporter. All citations should be made to the United States Code or some other officially recognized reporter.

15699 (INIS-mf–14501) **Energy policy in Bulgaria.** Shervashidze, N. Komitet po Energetika, Sofia (Bulgaria). 1994. 12p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95627066. Source: OSTI; NTIS (US Sales Only); INIS.

The energy policy of Bulgaria is based on a long-term strategy consistent with the natural resources of the country, expected macro-economical development, geopolitical situation and regional cooperation with neighboring countries. A special priority is energy saving. A comparative evaluation shows that the energy production is at a considerably higher technical and economical level than its utilization by the users. Energy intensity is 3-5 times higher than the average European level. The main future directions in energy policy are: 1) Assuring a base for energy independence through coal supply. A maximal development of profitable openpit mining and restriction of underground mining is foreseen. 2) Gasification as a direction with wide energetic, ecological and social implications. Usage of natural gas in household and energy sectors will give a positive restructuring effect on the energy balance, will increase the energy efficiency as an alternative and competition of the thermal district heating. 3) Realistic and constructive approach to atomic energy (giving now 75% of the primary energy resources) as a strong contribution to energy balance. 4) Rehabilitation and modernization of fossil-fuel power plants which will increase their usability by 10%. 5) Further development of hydro energy along with complex utilization of water and solution of the regional social problems. 6) Solving of technical and financial problems of district heating. One common concern for all energy branches is the pricing mechanism which should not only assure a payback, but possible investments in new objects as well. 3 figs.

15700 (NEI-SE–198) **Proceedings of the African conference on policy options and responses to climate change.** Silveira, S. (ed.). Stockholm Environment Inst. (Sweden). 1995. 79p. (CONF-941266–: African conference on policy options and responses to climate change, Nairobi (Kenya), 5-8 Dec 1994). Order Number DE95766696. Source: OSTI; NTIS.

The African Conference on Policy Options and Responses to Climatic Change in Nairobi, 5-8 December 1994 was an important event in the preparations for the Conference of the Parties (CoP) to the Climate Convention in March-April 1995. It was attended by 120 delegates and researchers from all over Africa representing governments and NGOs, as well as international organisations. The conference discussions resulted in this document containing recommen- dations for African governments that will participate in the CoP to the Climate Convention. Despite the success of the Conference in terms of providing a forum for discussions of African interests in relation to the Climate Convention, it is obvious that there is still work to be done in order to guarantee the full participation of African countries in inter- national environmental fora. As agreed at the Conference, full participation means that African countries take an active role in defining negotiation agendas, research priorities and international policies. There is no doubt that African countries are interested in such an active role in the context of the Climate Convention. The participation in the Conference did indicate the level of this interest quite well. Africa is aware of her dependence on climate conditions to guarantee the livelihood of the majority of her population. The security of Africa's people depends on climate conditions. This is indeed a sufficiently strong reason for the full engagement of African countries in further elaboration and implementation of the Climate Convention.

15701 (ORNL/M–3754) **Environmental Guidance Program reference book: Toxic substances control act. Revision 7.** Oak Ridge National Lab., TN (United States). 1 Dec 1994. 187p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008105. Source: OSTI; NTIS; GPO Dep.

This Reference Book contains a current copy of the Toxic Substances Control Act and those regulations that implement the statute and appear to be most relevant to DOE activities. The document is provided to DOE staff for informational purposes only and should not be interpreted as legal guidance. Questions concerning this Reference Book may be directed to Mark Petts, EH-231 (202/586-2609).

15702 (SAND–94-0854) **Outlook for renewable energy technologies: Assessment of international programs and policies.** Branstetter, L.J.; Vidal, R.C.; Bruch, V.L.; Zurn, R. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009084. Source: OSTI; NTIS; GPO Dep.

The report presents an evaluation of worldwide research efforts in three specific renewable energy technologies, with a view towards future United States (US) energy security, environmental factors, and industrial competitiveness. The overall energy technology priorities of foreign governments and industry leaders, as well as the motivating factors for these priorities, are identified and evaluated from both technological and policy perspectives. The specific technologies of interest are wind, solar thermal, and solar photovoltaics (PV). These program areas, as well as the overall energy policies of Denmark, France, Germany, Italy, the United Kingdom (UK), Japan, Russia, and the European Community as a whole are described. The present and likely future picture for worldwide technological leadership in these technologies-is portrayed. The report is meant to help in forecasting challenges to US preeminence in the various technology areas, particularly over the next ten years, and to help guide US policy-makers as they try to identify specific actions which would help to retain and/or expand the US leadership position.

15703 (SVF–532) **Compilation of EU-demands for combustion plants.** Hjalmarsson, A.K. (AaF-Energikonsult Stockholm AB, (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995 40p. (In Swedish). Order Number DE95766640. Source: OSTI; NTIS.

Directives are most commonly used to regulate environmental issues. The directives are usually set as minimum rules, meaning that the national laws cannot be weaker than the EU directive. Individual countries may have stricter laws, if they don't affect the free trade. There are directives limiting emissions into the atmosphere from large (> 50 MWt) combustion plants covering emissions of sulphur, nitrogen oxides and dust. For existing plants there are ceilings and reduction targets set individually on national basis. For new units emission limits are set for plants. The emission limits in Sweden set by laws and guidelines are stricter than the EU directives. New directives for large combustion plants should according to the plans be ready by the 1st of July 1995 - there is, however, not even a proposal yet. Emissions into the atmosphere from municipal waste incineration plants are covered in two directives, one for existing and one for new plants. There are also one proposal for more strict limits on emissions into the atmosphere and introduction of limits in emissions to water and solid residues. The proposal is stricter than the regulations in Sweden on several issues. There are directives covering other areas also affecting combustion plants to some extent, such as directives on solid residues. Work is in progress with varying results on proposals for directives on for example: - limitations of the sulphur content in heavy fuel oil, - application for a permit including environmental impact assessment, - taxes on CO_2 emissions. The directives for large combustion plants and for new and existing municipal waste incineration plants have been implemented in the Swedish regulations. 3 figs, 15 tabs

2940 Fossil Fuels

Refer also to citation(s) 14792, 14797, 14852, 15670, 15687, 15689, 15714

15704 (DOE/EE–0331) **Federal investment in fossil energy technology.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Mar 1995. 102p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010406. Source: OSTI; NTIS; GPO Dep.

On February 21, 1995, during a Congressional hearing on the FY 1996 budget request for the Department of Energy's Office of Fossil Energy, Congressman David Skaggs of the House Appropriations Committee Subcommittee on the Interior and Related Agencies, requested that Assistant Secretary Patricia Godley submit statements from private companies and others on the value of Federal investments in coal, oil and natural gas technology programs. Specifically, Rep. Skaggs asked for public testimony from private industry and others that would cite examples of technology that has been "brought to market viability or near viability that simply would not have happened if left to private investment decisions alone." The Department responded with the views of more than 280 industry officials, university professors, and State officials. Most of the responses cited specific technologies or advances that would not have been done, or done as quickly, without Federal investment. Others cited the educational opportunities created as part of Department of Energy-sponsored fossil energy university research. Still others cited improvements in the public knowledge base that have benefitted the private sector.

15705 (DOE/MC/28138–95/C0454) **Development of a Gas Systems Analysis Model (GSAM).** Becker, A.B.; Pepper, W.J. ICF Resources, Inc., Fairfax, VA (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC28138. (CONF-950494–3: Natural gas research, development and demonstration contractors review meeting, Baton Rouge, LA (United States), 4-6 Apr 1995). Order Number DE95011041. Source: OSTI; NTIS; INIS; GPO Dep.

Objective of developing this model (GSAM) is to create a comprehensive, nonproprietary, PC-based model of domestic gas industry activity. The system can assess impacts of various changes in the natural gas system in North America; individual and collective impacts due to changes in technology and economic conditions are explicitly modeled in GSAM. Major gas resources are all modeled, including conventional, tight, Devonian Shale, coalbed methane, and low-quality gas sources. The modeling system assesses all key components of the gas industry, including available resources, exploration, drilling, completion, production, and processing practices. Distribution, storage, and utilization of natural gas in a dynamic market-gased analytical structure is assessed. GSAM is designed to provide METC managers with a tool to project impacts of future research, development, and demonstration benefits.

15706 (NEI-NO–502) **The next generation of projects on the Norwegian continental shelf.** Bergseth, S. (Statoil (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 10p. (CONF-9408229–9: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766578. Source: OSTI; NTIS.

The conference paper describes some historical trends explaining the position of the Norwegian continental shelf (NCS) today and the challenges faced in the years to come. The paper discusses the Norwegian oil industry long term ambitions and objectives together with key principles to achieve these ambitions. The main objectives are to reduce the total field development costs by 30-40% compared to projects carried out before 1994, and to maintain the present standard of safety and quality. The key principles comprise the development of new supplier relations and technology concepts involving extended reach drilling, floating production units, and multiphase transportation technology. Examples are given through the Sleipner West field and the Norne field development projects.

15707 (NEI-SE–197) **SFS 1994:1776 Act of 20 December 1994 on taxes on energy.** Sweden. 29 Dec 1994. 24p. (In Swedish). Order Number DE95766705. Source: OSTI; NTIS.

The taxes introduced 1995 for fuels include an energy tax, a carbon dioxide tax and a sulfur tax proportional to the sulfur content of the fuel, for electric energy a kWh tax differentiated for consumer categories. Taxes on gasoline and fuel oils are divided in different environmental classes according to a.o. their content of aromatic hydrocarbons. The energy tax is for gasoline 3.22-3.81 SEK/liter, for fuel oils 577-1910 SEK/cubic meter, for natural gas 1498 SEK/1000 cubic meter (as a propellant) and 187 SEK/1000 cubic meter (other application), for coal and petroleum coke 245 SEK/ton; the carbon dioxide tax is 0.79, 982, 725, and 854 SEK respectively. The energy tax on electric energy is 0.01-0.09 SEK/kWh, the lowest amount for industry.

15708 (SR/OOG–94-02/1) **The Energy Information Administration's assessment of reformulated gasoline. Volume 1.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 28 Sep 1994. 103p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009451. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This report is divided into two volumes. The first volume contains EIA's findings and analyses on reformulated gasoline as it affects the petroleum industry. The data contained herein should assist members of the Congress, Federal, State and local governments, analysts, researchers, the media and academia to understand the RFG program and the current status of implementation. This second volume contains 10 appendices that include letter from Congressman Dingell, survey results, survey forms, and historical summary data. A glossary and a list of acronyms and abbreviations are printed in Volumes 1 and 2.

15709 (SR/OOG–94-02/2) **The Energy Information Administration's assessment of reformulated gasoline. Volume 2.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 29 Sep 1994. 157p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009452. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This report is divided into two volumes. This first volume contains EIA's findings and analyses on reformulated gasoline as it affects the petroleum industry. The data contained herein should assist members of the Congress, Federal, State and local governments, analysts, researchers, the media and academia to understand the RFG program and the current status of implementation. The second volume contains 10 appendices that include letter from Congressman Dingell, survey results, survey forms, and historical summary data. A glossary and a list of acronyms and abbreviations are printed in Volumes 1 and 2.

2950 Hydrogen and Synthetic Fuels

Refer also to citation(s) 15233

2960 Electric Power

Refer also to citation(s) 15687, 15688, 15695, 15698, 15713, 15714, 17325

15710 (DOE/BP–2522) **1994 Pacific Northwest loads and resources study.** USDOE Bonneville Power Administration, Portland, OR (United States). Dec 1994. 105p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009171. Source: OSTI; NTIS; GPO Dep.

The 1994 Pacific Northwest Loads and Resources Study presented herein establishes a picture of how the agency is positioned today in its loads and resources balance. It is a snapshot of expected resource operation, contractual obligations, and rights. This study does not attempt to present or analyze future conservation or generation resource scenarios. What it does provide are base case assumptions from which scenarios encompassing a wide range of uncertainties about BPA's future may be evaluated. The Loads and Resources Study is presented in two documents: (1) this summary of Federal system and Pacific Northwest region loads and resources and (2) a technical appendix detailing the loads and resources for each major Pacific Northwest generating utility. This analysis updates the 1993 Pacific Northwest Loads and Resources Study, published in December 1993. In this loads and resources study, resource availability is compared with a range of forecasted electricity consumption. The Federal system and regional analyses for medium load forecast are presented.

15711 (DOE/SWPA–9501) **The energy behind the power. Southwestern Power Administration 1994 annual report.** USDOE Southwestern Power Administration, Tulsa, OK (United States). [1994]. 50p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009327. Source: OSTI; NTIS; GPO Dep.

This is the Southwestern Power Administration 1994 annual report. The topics of the report include a letter to the secretary; an overview including the mission statement, a description of the Southwestern Federal Power System, financial statement, performance measurements, national performance review; year in review, summary of results, financial and statistical data and the Southwestern Power Administration Organization.

15712 (NEI-DK–1959) **Integrated resource planning. From the idea to the tool. Main report.** Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark); ELKRAFT A.m.b.A., Ballerup (Denmark). Oct 1994. 213p. (In Danish). Order Number DE95772382. Source: OSTI; NTIS.

The Danish cooperative electric utilities ELSAM and ELKRAFT and power distribution companies NESA and HEF/ELSAM have developed the integrated resource planning (IRP) according to international criteria and adjusted it to the Danish situation in the field of electric power supply. The purpose is to develop and improve the knowledge, methods and calculation tools, useful in planning tasks. Realistic and relevant calculation problems are given to demonstrate the function of the methods recommended here. A software and a database is established. This project should not be considered as the source of an integrated resource plan for the participating companies, it is meant to discuss the charges and social economy, demand side management (DSM), production and transmission, environmental aspects, consumer expectations etc., in terms of the Danish experience. Electric utilities should be serviced by a few special computer centers, analyzing current IRP/DSM values and optimizing their activities. These centers should apply the same software in order to improve their efficiency and comparability. (EG)

2980 Consumption and Utilization

15713 (DOE/BP–2524) **1994 Pacific Northwest loads and resources study. Technical appendix: Volume 1.** USDOE Bonneville Power Administration, Portland, OR (United States). Dec 1994. 780p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009161. Source: OSTI; NTIS; GPO Dep.

The 1994 Pacific Northwest Loads and Resources Study establishes the Bonneville Power Administration's (BPA) planning basis for supplying electricity t6 BPA customers. The Loads and Resources Study is presented in two documents: (1) this technical appendix detailing loads and resources for each major Pacific Northwest generating utility; and (2) a summary of Federal system and Pacific Northwest region loads and resources. This analysis updates the 1993 Pacific Northwest Loads and Resources Study Technical Appendix published in December 1993. This technical appendix provides utility specific information that BPA uses in its long-range planning. It incorporates the following for each utility: (1) electrical demand-firm loads; (2) generating resources; and (3) contracts both inside and outside the region. This document should be used in combination with the 1994 Pacific Northwest Loads and Resources Study, published in December 1994, because much of the information in that document is not duplicated here. This BPA planning document incorporates Pacific Northwest generating resources and the 1994 medium load forecast prepared by BPA. Each utility's forecasted future firm loads are subtracted from its existing resources to determine whether it will be surplus or deficit. If a utility's resources are greater than loads in any particular year or month, there is a surplus of energy and/or capacity, which the utility can sell to increase revenues. Conversely, if its firm loads exceed available resources, there is a deficit of energy and/or

capacity, and additional conservation, contract purchases, or generating resources will be needed to meet the utility's load.

15714 (DOE/EIA–0318(92)) **Commercial buildings energy consumption and expenditures 1992.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. Apr 1995. 474p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009672. Source: OSTI; NTIS; GPO; GPO Dep.

Commercial Buildings Energy Consumption and Expenditures 1992 presents statistics about the amount of energy consumed in commercial buildings and the corresponding expenditures for that energy. These data are based on the 1992 Commercial Buildings Energy Consumption Survey (CBECS), a national energy survey of buildings in the commercial sector, conducted by the Energy Information Administration (EIA) of the US Department of Energy. The statistics include: energy consumption; energy expenditures; location; energy intensities; energy intensities by location; principal building activity; other energy sources; and natural gas transported for the account of others.

15715 (DOE/EIA–M067(95)) **Model documentation report: Residential sector demand module of the National Energy Modeling System.** USDOE Energy Information Administration, Washington, DC (United States). Office of Integrated Analysis and Forecasting. Mar 1995. 224p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008309. Source: OSTI; NTIS; GPO Dep.

This report documents the objectives, analytical approach, and development of the National Energy Modeling System (NEMS) Residential Sector Demand Module. The report catalogues and describes the model assumptions, computational methodology, parameter estimation techniques, and FORTRAN source code. This document serves three purposes. First, it is a reference document providing a detailed description for energy analysts, other users, and the public. Second, this report meets the legal requirement of the Energy Information Administration (EIA) to provide adequate documentation in support of its statistical and forecast reports according to Public Law 93-275, section 57(b)(1). Third, it facilitates continuity in model development by providing documentation from which energy analysts can undertake model enhancements, data updates, and parameter refinements.

2990 Unconventional Sources and Power Generation

Refer also to citation(s) 15237, 15300, 15702

15716 (ETDE-DE–70) **For wider use of renewable energies.** Meliss, M. (Fachhochschule Aachen, Juelich (Germany). Solar-Institut Juelich). Bundesministerium fuer Wirtschaft, Bonn (Germany). Referat Oeffentlichkeitsarbeit. Oct 1994. 134p. (In German). Order Number DE95768809. Source: OSTI; NTIS (US Sales Only).

This brochure in popular language informs on the fundamentals and characteristics of all renewable energy uses realized in Germany. Information centers and advisory bureaus are printed out, and information regarding financing and government aid is given. Lists of contacts and some basic terms are appended. (UA)

15717 (INIS-mf–14491) **Renewable energy sources in Bulgaria - current state and trends.** Kolev, K. Energoproekt, Sofia (Bulgaria). 1994. 7p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95626681. Source: OSTI; NTIS (US Sales Only); INIS.

The over-dependency of Bulgaria on imported fuel stressed the importance of developing a new energy strategy based on energy saving which includes also using renewable energy sources (RES). The target is the substitution of at least 2 percent of the real primary energy consumption with RES by 2010. The author gives a generalized analysis of the available RES in Bulgaria -solar, wind, geothermal, biomass and mini-hydraulic. The potentialities of each source for its usage as a suitable energy supply are pointed out, as well as the current status of research and implementation work, problems connected with legislation, financing and production of particular facilities. The governmental policy concerning RES is considered briefly. A description is given to the project 'Technical and Economical Assessment of Possibilities for Expansion of the RES-part in the Energy Balance of the Country' developed and started in 1994 in the framework of the PHARE program. (orig.).

15718 (NEI-DK–1941) **Plan of action for solar energy 1995-97.** Solenergiudvalget (Denmark). Jan 1995. 30p. (In Danish). Contract ENS-51181-95.0029. Order Number DE95772345. Source: OSTI; NTIS; INIS.

Also available in English.

As part of Denmark's energy policy of utilizing renewable energy sources this plan of management covering 3 years (1995-97) has been produced by the Committee for Solar Energy (Solenergiudvalget) at the request of the Danish Energy Agency. It is stated that during 1992-94 the use of solar energy has developed satisfactorily. Supported by state subsidies, local and national information dissemination campaigns have stimulated sales which have increased from 200 to ca. 2500 solar heating systems annually during the past 7 years. The total number of these systems established in Denmark is 16.000. Resulting energy savings are 0.25% of total energy consumption for space and water heating. Yet some goals have been not yet been reached, the development of passive solar heating integrated in buildings and photovoltaic conversion has not been satisfactory. Attention should now be concentrated on these latter aspects but priority should still be given to active solar heating systems. Traditional suppliers should now be included in information dissemination activities. It is reckoned that state subsidies should no longer be necessary for solar energy promotion shortly after 1997, but this form of economical aid should be withdrawn gradually as development within this field continues. Standard subsidies should not be donated regionally. More details are given of plans for each of the 3 years, and of the the status, potentials and barriers for usage of solar energy in Denmark. Detailed lists are offered of available authorized Danish solar heating systems in relation to manufacturers. (AB)

15719 (NEI-DK–1965) **Plan of management for renewable energy 1995-97.** Energistyrelsen, Copenhagen (Denmark). VE-Raadet. Dec 1994. 94p. (In Danish). Order Number DE95772395. Source: OSTI; NTIS.

The Danish plan of management for the use of renewable energy sources is described in detail. It is planned that the use of renewable energy should be increased from 5% (in 1990) to 10% of total energy use in Denmark by 2005 in order to contribute to a reduction of carbon dioxide emission by a minimum of 20% by 2005. It is suggested that the latter goal could be reached more speedily if the increase in use of renewable energy sources should be even greater. In the short term, a number of renewable energy systems are not competitive with existing systems with regard to prices. The fluctuating nature of solar and wind resources demand the development of economical storage systems. There are also a number of organizational and institutional barriers to the increased use of renewable energy sources in Denmark. It is suggested that the technological prerequisites are present with regard to a speedy development of solar and wind energy facilities and that any barriers could by tackled using political initiatives. The recommendations of the Committee for Renewable Energy are given in detail especially in relation to the use of wind turbines, solar heating systems, methane from biomass, heat pumps and wave power. General issues on the promotion of Danish industry and exports and related to carbon dioxide are also dealt with. (AB)

30 DIRECT ENERGY CONVERSION

3001 MHD Generators

Refer also to citation(s) 16450, 17142

15720 (DOE/ET/15601–T64) **Diagnostic development and support of MHD test facilities. Technical progress report, January 1992–February 1992.** Shepard, W.S.; Cook, R.L. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 57p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC02-80ET15601. Order Number DE95009820. Source: OSTI; NTIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU) is developing diagnostic instruments for magnetohydrodynamic (MHD) power train data acquisition and for support of MHD component development test facilities. Microprocessor-controlled optical instruments, initially developed for Heat Recovery/Seed Recovery (HRSR) support, are being refined, and new systems to measure temperatures and gas-seed-slag stream characteristics are being developed. To further data acquisition and analysis capabilities, the diagnostic systems are being interfaced with DIAL's computers. Technical support for the diagnostic needs of the national MHD research effort is being provided. DIAL personnel also cooperate with government agencies and private industries to improve the transformation of research and development results into processes, products and services applicable to their needs.

15721 (DOE/ET/15601–T65) **Diagnostic development and support of MHD test facilities. Technical progress report, July 1991–September 1991.** Shepard, W.S.; Cook, R.L. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95009821. Source: OSTI; NTIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU) is developing diagnostic instruments for magnetohydrodynamic (MHD) power train data acquisition ,and for support of MHD component development test facilities. microprocessor-controlled optical instruments, initially developed for Heat Recovery/Seed Recovery (HRSR) support, are being refined, and new systems to measure temperatures and gas-seed-slag stream characteristics are being developed. To further data acquisition and analysis capabilities, the diagnostic systems are being interfaced with DIAL's computers. Technical support for the diagnostic needs of the national MHD research effort is being provided. DIAL personnel also cooperate with government agencies and private industries to improve the transformation of research and development results into processes, products and services applicable to their needs.

15722 (DOE/ET/15601–T67) **Diagnostic development and support of MHD test facilities. Technical progress report, July 1992–September 1992.** Shepard, W.S.; Cook, R.L. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95009823. Source: OSTI; NTIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU) is developing diagnostic instruments for magnetohydrodynamic (MHD) power train data acquisition and for support of MHD component development test facilities. Microprocessor-controlled optical instruments, initially developed for Heat Recovery/Seed Recovery (HRSR) support, are being refined, and new systems to measure temperatures and gas-seed-slag stream characteristics are being developed. To further data acquisition and analysis capabilities, the diagnostic systems are being interfaced with DIAL's computers. Technical support for the diagnostic needs of the national MHD research effort is being provided. DIAL personnel also cooperate with government agencies and private industries to improve the transformation of research and development results into processes, products and services applicable to their needs.

15723 (DOE/ET/15601–T68) **Diagnostic development and support of MHD test facilities. Final technical progress report, October 1992–September 1993.** Shepard, W.S.; Cook, R.L. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95009824. Source: OSTI; NTIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU) is developing diagnostic instruments for magnetohydrodynamic (MHD) power train data acquisition and for support of MHD component development test facilities. Microprocessor-controlled optical instruments, initially developed for Heat Recovery/Seed Recovery (HRSR) support, are being refined, and new systems to measure temperatures and gas-seed-slag stream characteristics are being developed. To further data acquisition and analysis capabilities, the diagnostic systems are being interfaced with DIAL's computers. Technical support for the diagnostic needs of the national MHD research effort is being provided. DIAL personnel also cooperate with government agencies and private industries to improve the transformation of research and development results into processes, products and services applicable to their needs.

15724 (DOE/ET/15601–T70) **Potassium emission absorption system. Topical report 12.** Bauman, L.E. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95009826. Source: OSTI; NTIS; GPO Dep.

The Potassium Emission Absorption System is one of the advanced optical diagnostics developed at Mississippi State University to provide support for the demonstration of prototype-scale coal-fired combustion magnetohydrodynamic (MHD) electrical power generation. Intended for application in the upstream of an MHD flow, the system directly measures gas temperature and neutral potassium atom number density through spectroscopic emission absorption techniques. From these measurements the electron density can be inferred from a statistical equilibrium calculation and the electron conductivity in the MHD channel found by use of an electron mobility model. The instrument has been utilized for field test measurements on MHD facilities for almost a decade and has been proven to provide useful measurements as designed for MHD nozzle, channel, and diffuser test sections. The theory of the measurements, a system description, its capabilities, and field test measurement results are reported here. During the development and application of the instrument several technical issues arose which when addressed advanced the state of the art in emission absorption measurement. Studies of these issues are also reported here and include: two-wavelength measurements for particle-laden flows, potassium D-line far wing absorption coefficient, bias in emission absorption measurements arising from dirty windows and misalignments, non-coincident multiwavelength emission absorption sampling errors, and lineshape fitting for boundary layer flow profile information. Although developed for NLHD application, the instrument could be applied to any high temperature flow with a resonance line in the 300 to 800 nm range, for instance other types of flames, rocket plumes or low temperature plasmas.

15725 (DOE/ET/15601–T71) **Particle size distribution instrument. Topical report 13.** Okhuysen, W.; Gassaway, J.D. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-80ET15601. Order Number DE95009827. Source: OSTI; NTIS; GPO Dep.

The development of an instrument to measure the concentration of particles in gas is described in this report. An in situ instrument was designed and constructed which sizes individual particles and counts the number of occurrences for several size classes. Although this instrument was designed to detect the size distribution of slag and seed particles generated at an experimental coal-fired magnetohydrodynamic power facility, it can be used as a nonintrusive diagnostic tool for other hostile industrial processes involving the formation and growth of particulates. Two of the techniques developed are extensions of the widely used crossed beam velocimeter, providing simultaneous measurement of the size distribution and velocity of articles.

3003 Thermoelectric Generators

Refer also to citation(s) 15230

15726 (IS-M–810) **An experimental search for high ZT semiconductors: A survey of the preparation and properties of several alloy systems.** Han, S.H.; Cook, B.A. Ames Lab., IA (United States). [1994]. 5p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract W-7405-ENG-82. (CONF-940830–4: 13. international conference on thermoelectrics, Kansas City, MO (United States), 30 Aug - 1 sep 1994). Order Number DE95010232. Source: OSTI; NTIS; GPO Dep.

A survey was conducted of several alloy systems identified as having certain properties thought to be desirable in high figure-of-merit thermoelectric materials. The systems examined include the cerium and lanthanum borocarbides, yttrium nitrides, osmium silicides, and titanium sulfides. Various approaches to the preparation of these alloy systems were explored including vapor transport, arc melting, and mechanical alloying. Among these systems, the borocarbides were found to exhibit p-type conductivity but generally suffered from relatively high carrier concentrations (on the order of $10^{21}/cm^3$) and low mobilities (≤ 10 cm^2/V-s). Both carbon and sulfur dopants produced the highest figure of merit ($0.13 \times 10^{-3}/°C$) in the yttrium nitride system at room temperature. Excess silicon was observed to increase carrier concentration and Hall mobility in osmium disilicide while additions of chromium were observed to stabilize the $OsSi_2$ crystal structure. Electrical power factors comparable to state of the art silicon-germanium alloys were achieved in titanium disulfide, however, the electrical transport properties were found to be critically dependent upon the amount of excess Ti in $Ti_{1+x}S_2$.

15727 (IS-M–811) **Development of improved p-type Si-20 at. % Ge by addition of fullerite.** Cook, B.A.; Harringa, J.L. Ames Lab., IA (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-940830–3: 13. international conference on thermoelectrics, Kansas City, MO (United States), 30 Aug - 1 sep 1994). Order Number DE95010230. Source: OSTI; NTIS; GPO Dep.

In a series of experiments designed to evaluate the possibility of lowering the lattice thermal conductivity of silicon-germanium alloys through the formation of an inert, intragrannular nanophase, a number of p-type Si-20 at. % Ge alloys, with a nominal doping level of 0.5 at. % boron, were prepared with varying amounts of fullerite, a mixture of 90% C_{60} + 10% C_{70} with a particle size of 0.7 nm. The alloys were synthesized by mechanical alloying (MA) and the fullerite was added at various stages of the preparation sequence. Compacts consolidated by hot pressing at temperatures of 1200 to 1265 C were found to be fully dense and homogeneous. Each compact was characterized by Hall effect at room temperature and also by electrical resistivity, Seebeck coefficient, and thermal diffusivity measurements to 1000 C. A reduction in thermal conductivity of up to 22% compared to standard p-type alloys was observed in samples containing 0.8 wt % additions. In this study, a maximum integrated average figure of merit, Z, between 300 and 1000 C of 0.65×10^{-3} $°C^{-1}$ was obtained, corresponding to 0.4 wt % addition of fullerite. Observation of selected samples by transmission electron microscopy revealed that the fullerite reacted with silicon to form nanophase SiC inclusions.

15728 (IS-M–813) **Fabrication of improved SiGe alloys for an 18-couple module test.** Loughin, S. (Martin Marietta Astro Space, Philadelphia, PA (United States)); Nakahara, J.F.; Centurioni, D.X.; Cook, B.A.; Harringa, J.L. Ames Lab., IA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-950110–20: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95010238. Source: OSTI; NTIS; INIS; GPO Dep.

N- and p-type $Si_{0.78}Ge_{0.22}$ alloys were fabricated to determine if recently reported improvements in the figure-of-merit, Z, could be realized in devices. These will be tested in an 18-couple module to directly compare the performance of these materials with that of standard coarse-grain SiGe used in flight programs. We describe the synthesis by vacuum casting and hot pressing p-type SiGe and mechanical alloying and hot-isostatic pressing n-type SiGe. Improved materials and standard materials are characterized and compared. The integrated average figures-of-merit (573–1273 K) of the improved materials were $Z_p = 0.59 \times 10^{-3}$ K^{-1} and $Z_n = 0.85 \times 10^{-3}$ K^{-1} compared with $Z_p = 0.52 \times 10^{-3}$ K^{-1} and $Z_n = 0.76 \times 10^{-3}$ K^{-1} for the standard materials. We also report the power factors for improved and standard materials removed from fabricated devices to gain insight as to how subsequent processing impacts performance.

3005 Fuel Cells

Refer also to citation(s) 15675

15729 (DOE/MC/28055–95/C0447) **Advances in tubular solid oxide fuel cell technology.** Singhal, S.C. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28055. (CONF-950683–1: 4. international symposium on solid oxide fuel cells, Yokohama (Japan), 18-23 Jun 1995). Order Number DE95008361. Source: OSTI; NTIS; GPO Dep.

This document provides the functional design criteria for an addition to the 222-S facility. This project will provide space for manipulator repair, equipment and manipulator decontamination and laundry storage. The manipulator repair and storage area will provide for storage of 20 manipulators, an area for receiving potentially contaminated manipulators and an area for the repair of manipulators. The decontamination area will be capable of decontamination of manipulators and shipping casks, pigs, T-handle carriers and other shipping containers. The laundry storage area will provide space for potentially contaminated and clean laundry.

15730 (DOE/METC/C–95/7170) **Solid oxide fuel cell commercialization in the United States.** Williams, M.C. USDOE Morgantown Energy Technology Center, WV (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). (CONF-9506143–1: 1995 Department of Energy/Agency of Industrial Science and Technology international fuel cell symposium, Yokohama (Japan), 12-16 Jun 1995). Order Number DE95008210. Source: OSTI; NTIS; GPO Dep.

This paper discusses aspects of solid oxide fuel cell (SOFC) technology commercialization in the US. It provides the status of the major SOFC developments occurring in the US by addressing both intermediate- and high-temperature SOFC's, several SOFC designs, including both planar and tubular, and SOFC system configurations. This paper begins with general characteristics, proceeds with designs and system configurations, and finishes with a discussion of commercialization, funding, and policies. The US Department of Energy's (DOE) Morgantown Energy Technology Center (METC) is the lead US DOE center for the implementation of a Research, Development, and Demonstration Program to develop fuel cells for stationary power. METC's stakeholders include the electric power and gas industries, as well as fuel cell developers and others. This paper offers some new perspectives on SOFC development and commercialization which come from the broad consideration of the commercialization efforts of the entire fuel cell industry.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

Refer also to citation(s) 14909, 15306, 15308, 15690, 16054, 16055, 17332, 17333

15731 (AUC-IBT-R–9335) **Model experiments in 1990 and on-site validation in 1992 of the air movement in the Danish Pavilion in Seville.** Indoor Environmental Technology Paper, 32. Fox, S.G.; Nielsen, P.V. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Oct 1993. 6p. (CONF-930701–10: 6. international conference on indoor air quality and climate, Helsinki (Finland), 4-8 Jul 1993). Order Number DE95772410. Source: OSTI; NTIS.

The purpose of the paper is to present the ventilation design concept, the model experiment results and the final measured values from the Danish Pavilion project. The reason for presenting these values is that the Danish Pavilion's indoor air climate was

excellent and the architecture outstanding, despite the facts that the indoor pollution load was high (smoking, perfumes, tightly packed people) and the ventilation system was cheap and simple. It is suggested that the combination of higher air temperatures and higher air velocities, 'summer breeze design', as used in the Danish Pavilion,may be applicable and cost effective in other building projects. (au)

15732 (AUC-IBT-R–9338) **Draught risk from cold vertical surfaces.** Indoor Environmental Technology Paper, 35. Heiselberg, P. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Oct 1993. 6p. (CONF-930701–9: 6. international conference on indoor air quality and climate, Helsinki (Finland), 4-8 Jul 1993). Order Number DE95772411. Source: OSTI; NTIS.

Glazed facades and atria have had a boom in the 1980's as an architectural feature in building design. Natural convective flows from these cold surfaces are in winter time, however, often the cause of thermal discomfort and there is a need for research to improve the design methods. The objective of the research is to develop expression for the airflow beyond the floor area, which influences the thermal comfort in the occupied zone. Measurements of velocities and temperatures are carried out in a two-dimensional test case. They show that the characteristics of the flow in the near floor region are very similar to the characteristics of stratified flows. Expressions have been developed for the rate of decrement of the maximum velocity with distance from the surface and for the maximum temperature difference between the cold airflow along the floor and the rest of the occupied zone. (au)

15733 (AUC-IBT-R–9339) **Model experiments for the determination of airflow in large spaces.** Indoor Environmental Technology Paper, 36. Nielsen, P.V. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Oct 1993. 6p. (CONF-930701–11: 6. international conference on indoor air quality and climate, Helsinki (Finland), 4-8 Jul 1993). Order Number DE95772412. Source: OSTI; NTIS.

Model experiments are one of the methods used for the determination of airflow in large spaces. This paper will discuss the formation of the governing dimensionless numbers. It is shown that experiments with a reduced scale often will necessitate a fully developed turbulence level of the flow. Details of the flow from supply openings are very important for the determination of room air distribution. It is in some cases possible to make a simplified supply opening for the model experiment. (au) (12 refs.)

15734 (AUC-IBT-R–9351) **Numerical prediction of buoyant air flow in livestock buildings.** Indoor Environmental Technology Paper, 37. Svidt, K. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Dec 1993. 8p. (CONF-9307218–1: 4. international livestock environment symposium, Coventry (United Kingdom), 6-9 Jul 1993). Order Number DE95772413. Source: OSTI; NTIS.

In modern livestock buildings air distribution and air quality are important parameters to animal welfare and to the health of full-time employees in animal production. Traditional methods for calculating air distribution in farm buildings are mainly based on formulas for air jets which do not include the effect of room geometry, obstacles or heat sources. This paper describes the use of Computational Fluid Dynamics to predict air flow patterns and temperature distribution in a ventilated space. Good agreement is found when results of numerical predictions are compared with experimental data. (au) (14 refs.)

15735 (AUC-IBT-R–9454) **The effect of obstacles on the boundary layer flow at a vertical surface.** Indoor Environmental Technology Paper, 46. Heiselberg, P.; Overby, H.; Bjoern, E. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Dec 1994. 10p. Contract ENS-1213/93-0014. (CONF-9410340–1: 5. expert meeting in special topic presentation at forum, Leamington Spa (United Kingdom), 25-29 Oct 1994). Order Number DE95772409. Source: OSTI; NTIS.

EFP-93.

Glazed facades may cause thermal discomfort due to downdraught. Convectors places close to the facade can prevent downdraught but cause an increase in the energy consumption. The objective of the research has been to investigate if the structural system of a glazed facade can be used to reduce downdraught and to avoid thermal comfort problems in the occupied zone. The effect of large obstacles on a cold boundary layer flow has been investigated for different temperature differences between a cold surface and the room air, different distances between the obstacles and different sizes of the obstacles. The effect of the obstacles on the boundary layer flow depended on the characteristics of the flow and of the sizes of the obstacles. With turbulent flow and an obstacle larger than the boundary layer thickness the boundary layer flow separated from the surface and a new boundary layer was established below the obstacle. The risk of thermal discomfort due to downdraught was reduced considerably. (au)

15736 (AU-IBT-R–9407) **Investigation of inlet boundary conditions for numerical prediction of air flow in livestock buildings.** Indoor Environmental Technology Paper, 38. Svidt, K. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Mar 1994. 10p. (CONF-9406327–1: ROOMVENT '94: 4. international conference on air distribution in rooms, Cracow (Poland), 15-17 Jun 1994). Order Number DE95772404. Source: OSTI; NTIS.

In modern livestock buildings the design of ventilation systems is important in order to obtain good air distribution. The use of Computational Fluid Dynamics for prediction of the air distribution makes it possible to include the effect of room geometry and heat sources in the design of ventilation systems. This paper presents numerical prediction of air flow compared with laboratory measurements. A commercial air inlet device for livestock buildings was used in the experimental set-up. In the numerical predictions special attention was paid to the specification of boundary conditions for this type of inlet. (au) (15 refs.)

15737 (AU-IBT-R–9416) **Air distribution in rooms. Research and design methods.** Indoor Environmental Technology Paper, 41. Nielsen, P.V. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Jul 1994. 19p. (CONF-9406327–2: ROOMVENT '94: 4. international conference on air distribution in rooms, Cracow (Poland), 15-17 Jun 1994). Order Number DE95772405. Source: OSTI; NTIS.

The research on air distribution in rooms is often done as full-size investigations, scale-model investigations or by Computational Fluid Dynamics (CFD). New activities have taken place within all three areas and this paper draws comparisons between the different methods. The outcome of the IEA (International Energy Agency) sponsored research 'Air Flow Pattern within Buildings' is used for comparisons in some parts of the paper because various types of experiments and many countries are involved. The trend in design methods is illustrated by full-size experiments, model experiments, CFD-methods and flow element methods. The CFD-method has grown in popularity for large projects but the flow element method is still developing for the more general situations. (au) (18 refs.)

15738 (AU-IBT-R–9417) **Measurement and calculation of vertical temperature gradients in rooms with convective flows.** Indoor Environmental Technology Paper, 42. Overby, H. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Jul 1994. 17p. Contract ENS-1213/93-0014. (CONF-9406327–3: ROOMVENT '94: 4. international conference on air distribution in rooms, Cracow (Poland), 15-17 Jun 1994). Order Number DE95772406. Source: OSTI; NTIS.

EFP-93.

The paper deals with experimental and theoretical examinations of the vertical temperature gradient in rooms with convective flows under transient conditions. The measurements are carried out in a laboratory test room of three different sizes. A small room (7.25 m^2) with a normal room height of 2.4 m (only the result of this experiment is described in the paper), a small room with a large room height of 3.3 m and a room (10.70 m^2) with a room height of 3.3 m. For normal rooms with only convective air flows it is concluded that it is possible to find two dimensionless temperature profiles, one for periods with rising air temperatures and one for periods with falling air temperatures (heating/cooling periods). The dimensionless gradients are possibly independent of the room dimension because of the turbulence intensity in the boundary layer. By using the dimensionless temperature profiles it is possible to find the horizontal location of a simulated mean air temperature and with a good approximation it is possible to determine the actual vertical

temperature profile, even under transient conditions, if only two air temperatures are known (simulated), an air temperature in an upper zone and lower zone of the room, respectively. Furthermore, it is concluded that this is a better description of the vertical temperature gradient than a linear description, which is often used when only two air temperatures are known. (au) (13 refs.)

15739 (AU-IBT-R–9427) **Interaction between flow elements in large enclosures.** Indoor Environmental Technology Paper, 44. Heiselberg, P. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Sep 1994. 14p. Contract ENS-1213/93-0014. (CONF-9406327–4: ROOMVENT '94: 4. international conference on air distribution in rooms, Cracow (Poland), 15-17 Jun 1994). Order Number DE95772407. Source: OSTI; NTIS.

EFP-93.

Several sources for the air movement in large enclosures as for example diffusers, pressure difference around the construction, cold downdraught and thermal plumes make it difficult to use simplified design methods for the air distribution system as the methods based on thrown of jets and penetration depths of non-isothermal jets. When those different flow elements at the same time occur in a room they will influence each other and the air flow pattern will depend on the individual strength of each element and the way they act together. The results of model experiments show that the penetration depths and the paths of cold jets in enclosures are not influenced by the presence of distributed heat sources and only slightly influenced by the presence of concentrated heat sources. However, different locations and different strengths of a heat source in an enclosure may result in quite different air flow patterns. It is therefore necessary in cases with heat sources in an enclosure to take the flow from these air movement sources into account in the designing procedure of efficient ventilation systems. (au)

15740 (AU-IBT-R–9430) **Air distribution in animal sheds - computer calculations and simple methods.** Svidt, K. (Den Kgl. Veterniaer- og Landbohoejskole, Inst. for Hysdyrbrug og Husdyrsundhed, Frederiksberg (Denmark)). Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik; Kongelige Veterinaer- og Landbohoejskole, Copenhagen (Denmark). Inst. for Husdyrbrug- og Husdyrsundhed. 1994. 44p. (In Danish). Order Number DE95772417. Source: OSTI; NTIS.

Ventilations systems in barns, stables, cowsheds, pig styes, poultry sheds and byres must ensure the indoor air quality, and the removal of excess heat and moisture produced by the animals or poultry, without producing draughts that could endanger the animals' health. The possibilities for the use of detailed computer calculations on and simulations of, the prediction of air flow and air quality in buildings that shelter livestock are investigated. These methods are described. (AB)

15741 (AU-IBT-R–9446) **Prospects for computational fluid dynamics in room air contaminant control.** Indoor Environmental Technology Paper, 45. Nielsen, P.V. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik. Dec 1994. 20p. (CONF-9409144–1: 4. international symposium on ventilation for contaminant control: from research to practice - from practice to research, Stockholm (Sweden), 5-9 Sep 1994). Order Number DE95772408. Source: OSTI; NTIS.

Fluid dynamics research is strongly influenced by the increasing computer power which has been available for the last decades, and the computation time is also decreasing. This tendency has also influenced indoor environmental technology. Computational Fluid Dynamics (CFD) is not only an important tool for the prediction of flow and contaminant distribution in ventilated spaces, it is also useful for research on local exhaust arrangements such as laboratory fume hoods, paint booths, push-pull systems, canopy hoods etc. Computational Fluid Dynamics for contaminant control is based on different equation systems as is shown. A variety of different developments of numerical method are discussed. A short discussion of the results from the activities sponsored by the International Energy Agency (IEA) during the period 1988 to 1991 is mentioned and the main part of the paper contains results from CFD prediction of contaminant transport in ventilated areas. Contaminant control with local exhaust openings is also dealt with. (AB) (36 refs.)

15742 (CONF-9403214–) **International lighting in controlled environments workshop: Proceedings.** Wisconsin Univ., Madison, WI (United States). [1994]. 393p. Sponsored by USDOE, Washington, DC (United States);Department of Agriculture, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States);National Science Foundation, Washington, DC (United States);American DOE Contract FG02-93ER20130. From International lighting in controlled environments workshop; Madison, WI (United States); 27-30 Mar 1994. Order Number DE95008170. Source: OSTI; NTIS; GPO Dep.

Lighting is a central and critical aspect of control in environmental research for plant research and is gaining recognition as a significant factor to control carefully for animal and human research. Thus this workshop was convened to reevaluate the technology that is available today and to work toward developing guidelines for the most effective use of lighting in controlled environments with emphasis on lighting for plants but also to initiate interest in the development of improved guidelines for human and animal research. There are a number of established guidelines for lighting in human and animal environments. Development of new lighting guidelines is necessary for three reasons: (1) recent scientific discoveries show that in addition to supporting the sensation of vision, light has profound nonvisual biological and behavioral effects in both animals and humans; (2) federal regulations (EPACT 1992) are requiring all indoor environments to become more energy efficient with a specific emphasis on energy conservation in lighting; (3) lighting engineers and manufacturers have developed a wealth of new light sources and lighting products that can be applied in animal and human environments. The workshop was aimed at bringing together plant scientists and physical scientists to interact in the discussions. It involved participation of biological scientists involved in studying mechanisms of light reactions and those involved in utilizing lighting for production of plants and maintenance of animals in controlled environments. It included participation of physical scientists from universities and government involved in research as well as those from industry involved in producing lamps and in construction of controlled growth facilities. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

15743 (CONF-950624–1) **Improving the energy efficiency of refrigerators in India.** Sand, J.R. (Oak Ridge National Lab., TN (United States)); Vineyard, E.A.; Bohman, R.H. Oak Ridge National Lab., TN (United States). [1995]. 38p. Sponsored by USDOE, Washington, DC (United States);Assisting Deployment of Energy Practices and Technologies (ADEPT) Program. DOE Contract AC05-84OR21400. From Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; San Diego, CA (United States); 24-28 Jun 1995. Order Number DE95009127. Source: OSTI; NTIS; GPO Dep.

Five state-of-the-art, production refrigerators from different manufacturers in India were subjected to a variety of appliance rating and performance evaluation test procedures in an engineering laboratory. Cabinet heat loss, compressor calorimeter, high-ambient pull-down, and closed-door energy consumption tests were performed on each unit to assess the current status of commercially available Indian refrigerators and refrigerator component efficiencies. Daily energy consumption tests were performed at nominal line voltages and at 85% and 115% of nominal voltage to assess the effect of grid voltage variations. These test results were also used to indicate opportunities for effective improvements in energy efficiency. A widely distributed "generic" computer model capable of simulating single-door refrigerators with a small interior freezer section was used to estimate cabinet heat loss rates and closed door energy consumption values from basic cabinet and refrigeration circuit inputs. This work helped verify the model's accuracy and potential value as a tool for evaluating the energy impact of proposed design options. Significant differences ranging from 30 to 90% were seen in the measured performance criterion for these "comparable" refrigerators suggesting opportunities for improvements in individual product designs. Modeled cabinet heat loadings differed from experimentally extrapolated values in a range from 2–29%, and daily energy consumption values estimated by the model differed from laboratory data by as little as 3% or as much as 25%, which indicates that refinement of the model may be needed for

this single-door refrigerator type. Additional comparisons of experimentally measured performance criteria such as % compressor run times and compressor cycling rates to modeled results are given. The computer model is used to evaluate the energy saving impact of several modest changes to the basic Indian refrigerator design.

15744 (CTH-PUBL–93-8) **Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.** Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. 157p. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). Order Number DE95766686. Source: OSTI; NTIS.

In the Nordic countries it has been decided to stop the use of CFC-gases in polymeric materials. This decision primarily affects Polyurethane Cellular Plastics (PUR-foam). As a blowing agent for PUR foam CFC has ensured an excellent type of insulation materials and good mechanical properties. The ban of CFC is a very big challenge to both industry and users of PUR foam. Thus, the need for new materials and techniques is great. This seminar was planned in order to give scientists, technicians and users of PUR-foam an opportunity for exchanging new ideas and experience. The seminar comprised of three sessions. 1. Status and experience (6 papers), 2. Technical solutions (7 papers), and 3. Future possibilities (5 papers). Separate abstracts have been prepared for 16 of the 18 papers.

15745 (DOE/GO–10095-073) **Tomorrow's energy today for cities and counties: Build up energy savings with residential standards.** National Renewable Energy Lab., Golden, CO (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000290. Source: OSTI; NTIS; GPO Dep.

The paper reveals residential energy efficiency standards that will pay financial and environmental dividends to local communities.

15746 (DOE/GO–10095-074) **Tomorrow's energy today for cities and counties.** National Renewable Energy Lab., Golden, CO (United States). Feb 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000291. Source: OSTI; NTIS; GPO Dep.

The document focuses on the use of commercial building energy codes to promote energy efficiency and achieve cost savings in communities. Energy conservation codes used in Montgomery County, Maryland and San Francisco, California are used as examples.

15747 (DOE/GO–10095-129) **FEMP: What's new in Federal Energy Management.** National Renewable Energy Lab., Golden, CO (United States). Mar 1995. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94000228. Source: OSTI; NTIS; GPO Dep.

The modernization of the Federal office building complex at 26 Federal Plaza in New York City includes energy efficiency retrofits in order to meet goals for reducing energy consumed in federal buildings. The Federal Energy Management Program (FEMP) is working with others to renovate the New York complex.

15748 (DOE/R6/99305–T3) **Development of single crystal filaments. Final report.** Milewski, J.V.; Shoultz, R.A.; Bourque-McConnell, M.M. Superkinetic, Inc., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG46-93R699305. Order Number DE95009807. Source: OSTI; NTIS; GPO Dep.

The program just completed addresses a route to a more efficient longer-lasting electric light bulb filament. All current filaments for light bulbs are metallic in nature. They are subject to embrittlement with age (large grain growth) and relatively high vapor pressures which limits their operating temperature. There is evidence which suggests advantages to using high temperature refractory single crystal fibers as a filament for a light bulb. These refractory materials may include materials such as hafnium or tantalum carbide which have melting points about 500°C higher than tungsten. Another advantage is that single crystal fibers have a very high degree of crystalline perfection with very few voids and dislocations. Without these imperfections, the atomic mobility at high temperatures is highly restricted. Thus single crystal fibers are very stable at high temperature and will last longer. The efficiencies result from running these single crystal ceramic fiber filaments at higher temperatures and the higher emissivity of the carbide filaments compared to tungsten. The amount of visible light is proportional to the 4the power of the temperature thus a 500°C higher operating give about a 3-fold increase in radiation in the visible range. The program accomplishments can be summarized as follows: (1) Single crystal fibers of JfC sufficient crystal quality for light bulb filament applications were made. (2) The HfC fiber furnace growth chamber, power control and data collection system was developed for the laboratory scale plant. (3) method for mounting and apparatuses for testing the single crystal fiber filaments were developed and built.

15749 (ETDE-DE–83) **Measurement, development and comparison of combined systems for heating and ventilation. Final report.** Siegmund, H.; Mazanec, J.; Steimle, F.; Mengede, B. EHT Siegmund GmbH, Bad Honnef (Germany); Essen Univ. (Gesamthochschule) (Germany). Inst. fuer Angewandte Thermodynamik und Klimatechnik. Oct 1992. 27p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0335013A. Order Number DE95770345. Source: OSTI; NTIS (US Sales Only).

Heat losses in ventilation systems are gaining increasing importance, due to the continuing reduction in the heat losses during transmission in buildings. High energy saving potentials can be found by applying suitable heat recovery measures a controlled ventilation systems. Within the framework of this project, heating and ventilation systems could be developed which, with regard to their operational costs and energy used, compare lower to existing systems. The extensive long-term investigations regarding the optimization and determination of general parameters and their tests in pilot projects could reveal both finding about possible fields of application and from the basis of a simplified design- and calculation method. (orig.)

15750 (ETDE-DE–90) **Heating and cooling in small living units. Final report.** Gerlich, A.; Lang, R.; Knoche, K.F. Technische Hochschule Aachen (Germany). Lehrstuhl fuer Technische Thermodynamik und Inst. fuer Thermodynamik. [1993]. 101p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328890A. Order Number DE95769959. Source: OSTI; NTIS (US Sales Only).

The present article reports on studies on adsorption heat pumps and properties of the zeolite-water system. Specifically, it deals with heat pump cycles; properties of the zeolite-water system; development of a high-capacity adsorber; development of a pilot system; simulation of a modular adsorption heat pump; and commercialisation of a laboratory system. (HW)

15751 (ETDE-DE–91) **Heat pumps within the concept of non-conventional heat supply.** Albring, P.; Heinrich, G.; Pietsch, A. Institut fuer Luft- und Kaeltetechnik GmbH, Dresden (Germany). 1993. 16p. (In German). Order Number DE95770323. Source: OSTI; NTIS (US Sales Only).

The paper describes possible ways of improving heat pump processes for space heating using small-type heat pumps. The great potential of an economically efficient use of heat pumps lies in the use of favourable heat sources and design of heating installations adapted to heat pumps. The fact that the costs for heating installations equipped with heat pumps are comparable with those for conventional heating installations is demonstrated by an example. (orig./UA)

15752 (ETDE-DE–92) **System-adapted electronic devices (SAGE). Final report.** Koscielny, F.G. Selected Electronic Technologies GmbH (SET), Wedel (Germany). Dec 1992. 14p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328813A. Order Number DE95770343. Source: OSTI; NTIS (US Sales Only).

Within the framework of the RandD project reliable and cost efficient electronic circuits and concepts have been developed for system control units, electronic ballasts for energy saving lamps and inverters. In part 1 a twilight-time-switch was realized. By

means of the LME (Load Management Electronic) the system efficiency of AC systems could be increased because there is no need to design the inverters to the peak-load. Finally the investigation of electronic ballasts resulted in a new concept based on pure DC circuits. (orig.)

15753 (IEE-SR–256) **Influence of a household' holding more than one home-use air conditioners on the demand for air cooling. From the survey of the actual status of air conditioner use.** Institute of Energy Economics, Tokyo (Japan). Aug 1994. 85p. (In Japanese). Order Number DE95764071. Source: OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan.

The paper investigates the actual status of home-use air conditioners used at a peak time. A relation is studied between the number of a household's holding air conditioners and the actual status of use. Influence of a household's holding more than one air conditioners on the demand for home-use air cooling is considered by making a comparative analysis of predetermined temperatures by room and the room situation such as a living room, and a bed room and children's room for which air conditioners purchased second or after are mostly used. As a result, it is found that in the daytime, about 10% of the households use more than one air conditioners at the same time, and about 50% use only one, and that as the number of holding air conditioners increases, the number of air conditioners which work as the second or the third increases. The conclusion obtained is that the grasp of the present status, future spread and potential of air conditioner use by room will contribute to future growth of the demand for home-use air cooling in the daytime. However, it is thought that with advent of the aged society, great changes will be seen in constituent members of the family, construction of the house and life style. 73 figs., 40 tabs.

15754 (KTH-BYT-AR–93-1) **The Stockholm project, block Konsolen. Energy concept evaluation of apartment houses with solar wall, heavy frame, and heat pump.** Eriksson, S.O. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Building Technology. 1993. 105p. (In Swedish). Project BFR-870739-3. Order Number DE95766697. Source: OSTI; NTIS.

The Stockholm project is a full scale research project which, in few words, will contribute to a new generation of energy efficient apartment buildings. The project contains six houses in which 'Konsolen' is one. The block of Konsolen consists of two L-formed, four storey balcony access buildings with altogether 57 flats. It was built with prefabricated concrete elements. The energy concepts evaluated in Konsolen are: - The Solar wall. A solar collector integrated with an outer wall construction where the supply air is preheated by solar energy striking the wall. - The Heavy frame. The buildings have a high thermal mass. This has been used to downsize the power of the heating system. Normally, this kind of building is dimensioned for a design outdoor temperature of -18 degrees C. In this case, -13 degrees C has been used. - The Heat pump. A heat pump takes heat from the exhaust air and dumps it into the domestic hot water system or the radiator system. A great part of the evaluation work was long time measurements. The buildings have been extensively monitored. Data concerning energy use, indoor temperatures and weather have been collected as hourly averages during almost four years. Results from Konsolen and the other buildings in the Stockholm Project show that it is possible to significantly decrease the heating demand in new multi-family buildings. The results also show an increase of electricity usage, especially for building services. This highlights the importance of careful inspections and trimming of building services. 20 refs, 40 figs, 6 tabs

15755 (LBL-PUB–758) **From the lab to the marketplace: Making America's buildings more energy efficient.** Lawrence Berkeley Lab., CA (United States). Jan 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95008445. Source: OSTI; NTIS; GPO Dep.

Since the mid 1970s, DOE has invested some $70 million in research and development at Lawrence Berkeley Laboratory (LBL) for energy-efficiency studies of advanced building technologies. That investment has helped spawn a $2.4-billion US market for key products – energy-efficient lighting and advanced window coatings – and efficiency standards for residential equipment and computerized tools for more efficient building design. By 1993 DOE's initial investment had reduced consumers' energy bills by an estimated $5 billion ($1.3 billion in 1993 alone). By 2015 the authors estimate that the products of that investment will save consumers $16 billion annually. But LBL research partnerships address a host of other building technology issues as well-building technology issues whose economic benefits are less easy to quantify but whose overall worth is equally important. They analyze public policy issues such as the role of efficiency options as a mitigation strategy for global climate change. They develop planning and demand-management methodologies for electric and gas utilities. They identify technologies and analytical methods for improving human comfort and the quality of indoor air. They contribute to the information superhighway. They focus on the special problems and opportunities presented by energy use in the public sector. And they do all these things at the local, national, and international levels. At LBL, they are part of the multi-laboratory, interdisciplinary approach to building technology research supported by DOE's Office of Energy Efficiency and Renewable Energy. They also participate in buildings-related research supported by DOE's Office of Health and Environmental Research, other federal agencies, and industry. This document describes LBL's role within this wider effort.

15756 (NEI-DK–1879) **Thermo logica. Analysis of measurements.** Kloch (N.P.), Nivaa (Denmark). Dec 1994. 120p. (In Danish). Contract ENS-1213/91-0019. Order Number DE95766438. Source: OSTI; NTIS.

EFP-91.

An analysis of measurements taken on a house constructed for testing purposes related to energy conservation. The measured data are included in the form of numerous appendices and it is deliberated whether the mode of construction, mainly of the outer walls, was suited for purposes of saving energy. These supporting walls are made of 12 mm steel plates dug down to a depth of 1.5 meters. On the inside the steel plates are insulated with a layer of 400 mm and outside of 50 mm insulation material. Other kinds of construction were demonstrated so that that a number of principles could be tested. The results are described in detail. In relation to the south facade, the heating up of the steel plate from the earth had no influence, but it did in the case of the walls facing other directions, but only at their bases, with no influence regarding heating with regard to the middle part of the outside wall and none at all for the top of it. (AB)

15757 (NEI-DK–1905) **Olf and energy. Phase 3. Renovation of a high olf building to become a low-olf building.** Beuningen, M. van; Clausen, G.; Pejtersen, J.; Fanger, P.O. Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varme- og Klimateknik. Dec 1994. 145p. (In Danish). Contract ENS-1213/91-0013. Order Number DE95766549. Source: OSTI; NTIS.

In relation to indoor quality in office buildings the influence of building-related air pollution sources on indoor air quality as perceived by humans and the reliability and validity of the trained-panel method for evaluating air quality in space are studied. Sensory panels (a group of 'naive', or trained, persons who judge air quality by using their noses) were used to quantify the air quality. The theoretical backgrounds of methods used are described, with some emphasis on the concept of environmental psychology which studies the interrelationships of behaviour and environment, using the human information processing model as one of the theoretical frameworks. In addition to the basic concepts of indoor air quality. building-related air pollution sources are discussed. In order to identify the main air pollution sources, explorative investigations were carried out in the building and laboratory experiments were made in order to select intervention measures. The effect of the selected measures on the air quality in the building was studied using the sensory panels of people. A questionnaire survey was performed among the occupants of the building to collect information on their perception of building-related problems/air pollution sources. Recommendations included floor renovation, spray-extraction of carpeted areas, avoidance of high paper loads in a room, improved cleaning, and shading for windows where occupants complained of eye irritations. (AB)

15758 (NEI-DK–1940) **Total energy solution at Skotteparken, Egebjerggaard in Ballerup.** Vejsig Pedersen, P. Cenergia ApS, Ballerup (Denmark). Jan 1995. 80p. (In Danish). Contract ENS-1213/91-0009. Order Number DE95772358. Source: OSTI; NTIS.

EFP-91.

Skotteparken in Egebjerggaard, Ballerup (Denmark) is an experimental building complex comprising 100 low-energy homes using solar heating where the aim is to reduce gas consumption for space and water heating by 60% and also to save electricity and water. The initiatives taken are the use of extra insulation, low emission window glass, heat recovery with regard to ventilation systems, local solar heating systems for domestic water heating and space heating, pulse operation of low-temperature district heating distribution network, local heat and water meters, computerized control and monitoring systems, thermostats on shower facilities and water-saving taps in kitchens and bathrooms, low-energy bulbs and pumps with a low energy consumption and heat supply from the local cogeneration plant. All these initiatives are described in detail. (AB)

15759 (NEI-DK–1958) **Investigation of indoor climate and energy consumption in connection with a pilot project in Roedovre.** Byggestyrelsen, Copenhagen (Denmark). Oct 1994. 119p. (In Danish). Order Number DE95772346. Source: OSTI; NTIS.

A description of an investigation carried out at a block of 51 flats, 'Engen' in Roedovre, Denmark, heated by an air-warming blow-in and ventilation system (also comprising heat recovery) and where each room is equipped with a small electric radiator to enable individual regulation of indoor temperature. The investigation concentrated on energy consumption, indoor climate conditions and consumer satisfaction. The electric radiators were not often used as occupants chose to increase the blow-in temperature which is regulated by the outside temperature so that a large proportion of heating needs were covered by district heating thus increasing energy consumption and resulting in thermal comfort problems. When the electric heaters were turned off the blow-in heat was not enough to warm the cold air near the windows. Occupants complained of draughts. They had highly different demands on thermal comfort (often dependent on age, standard of health etc.) and the location of individual flats also influenced thermal comfort conditions. 30% of occupants were not satisfied with the heating system in winter and 50% complained of irritation of eyes, nose and throat or headaches. On the basis of experience gained at this block of flats a new block was constructed in Vejle. This is described as a functionally separated building system, a column/plate system where all installations are gathered together. The adjustments that were made on the basis of problems experienced in the Roedovre block of flats are described in detail. (AB)

15760 (NEI-DK–1966) **Control of the energy. Status report 1993/94. Description. Analyses and evaluation.** Energistyrelsen, Copenhagen (Denmark). 1995. 37p. (In Danish). Order Number DE95772394. Source: OSTI; NTIS.

As a follow-up of Denmark's energy and environmental policy as presented in the document "Energy 2000 - Plan of Management for a Sustainable Development" (Energi 2000 - Handlingsplan for en baeredygtig udvikling) the State must also contribute to the achievement of the goal of reducing the country's total emission of carbon dioxide by 20% by 2005. In 1992 a campaign, designated "Styr paa energien" (Control of the energy) and involving all State institutions, was initiated. This report presents an account of the status of the campaign which runs for three years and is based on energy efficiency in buildings where State activities are carried out, information dissemination and energy conservation consultancy. Activities undertaken during the campaign per July 1st, 1994, are described in addition to the total energy consumption in buildings where State activities take place for the period 1990-93. The character of this energy consumption is analysed and evaluated. The energy consumption within individual ministries and the question of whether the State sector can achieve the goal of reducing CO_2 emission by 10-15% by 2005 is addressed. (AB)

15761 (NEI-DK–1967) **Control of the energy. Status report 1993/94. Supplement.** Energistyrelsen, Copenhagen (Denmark). 1995. 41p. (In Danish). Order Number DE95772396. Source: OSTI; NTIS.

This supplement to the document of the same main title gives data on energy consumption related to individual ministries within the Danish government in addition to a survey of State institutions and details of investment in energy-saving initiatives. (AB)

15762 (NEI-DK–1973) **Efficient and energy-saving lighting in industrial buildings.** Clausen, V.; Klausen, J. DELTA Lys og Optik, Lyngby (Denmark); Lysteknisk Selskab, Stenloese (Denmark). 1995. 35p. (In Danish). Order Number DE95772370. Source: OSTI; NTIS.

The document, which is illustrated by a number of coloured photographs, gives detailed information on lighting suitable for many types of industrial premises, processes and facilities in connection with employers' working conditions, with special emphasis on the metal, graphic, wood, ship, medicinal, food, and textile industries and canteens. Guidelines are given on the quality of suitable lighting systems which are efficient, energy-saving and attractive. A scheme for the registration of electricity consumption by lighting systems is presented in addition to a short glossary of Danish related terminology. (AB)

15763 (NEI-DK–1975) **Energy management in larger building blocks.** Energistyrelsen, Copenhagen (Denmark). Feb 1995. 78p. (In Danish). Order Number DE95772377. Source: OSTI; NTIS.

It is recommended to initiate energy management in all larger buildings, to set up a new consultancy service to support the energy management as a substitute for the three existing consultancy services for larger properties in Denmark, to ensure that certain minimum payments should be obligatory and to employ the services of an authorized consultant for part of the work. This should give flexibility and all types of energy saving will be covered, energy conservation will be optimized and economic aspects will be improved. The aims of energy management are to influence consumers' behaviour with regard to the use of energy, promote energy efficiency, reveal the possibilities for energy saving resulting from technical innovation/retrofitting. The most important means are control of energy consumption by registration and evaluation of individual consumption, and an annual inspection in the course of which consumers' behaviour related to energy consumption, overall energy consumption in the building, and energy-using systems are evaluated and where new ideas on how to save energy can surface so that an annual energy plan based on previous evaluation can be constructed and suggestions for new initiatives can be gathered together. (AB)

15764 (NEI-DK–1981) **Report on informative electricity bills.** Danske Elvaerkers Forening, Copenhagen (Denmark). Feb 1994. 60p. (In Danish). Order Number DE95772384. Source: OSTI; NTIS.

With regard to Denmark's energy and environmental policies, Danish electric power distribution companies, in connection with measures for saving energy and thus reducing pollution, are currently establishing energy consultancy services, informative public campaigns, the training of consultants, energy surveys, the setting up of energy advisory centers etc. Informative electricity bills are used as a tool in a number of energy saving activities, to inform consumers on the nature of their electricity consumption and so stimulate an interest in saving energy. The concept is described in detail and information is given on earlier initiatives, the current status of existing calculation systems, an evaluation of the technological potentials of meter reading, the sending out of electricity bills and the economic consequences. Examples of ways setting up household electricity bills are given. It is seen as a problem that in some localities bills are sent out that include many services so that attention can be distracted form electricity consumption. In the case of larger industrial firms and public institutions consultancy services are judged to be more effective than informative electricity bills. It is suggested that in the case of household bills gross prices should be stated (including tariffs) and information given on the nature of the energy consumption for the preceding year in addition to tips on how to save electricity. Ideas are also presented regarding electricity bills sent to industrial firms and public institutions, involved computer systems, overall costs and billing and payment systems. (AB)

15765 (ORNL/Sub–91-SK078/1) **National Energy AudiT (NEAT): Users manual.** Krigger, J. (Saturn Resource Management, Helena, MT (United States)); Adams, N.; Gettings, M. Oak Ridge National Lab., TN (United States). Jul 1993. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009937. Source: OSTI; NTIS; GPO Dep.

NEAT (National Energy AudiT), the US DOE's new energy auditing tool, is a program for personal computers that was designed for use by local agencies in the Weatherization Assistance Program. This manual describes in detail the instructions for using the NEAT program.

15766 (SP–95-08) **Thermal insulating materials. Thermal conductivity variations in mineral wool and expanded polystyrene.** Jonsson, B. Swedish National Testing and Research Inst., Boraas (Sweden). 1995. 30p. (In Swedish). Order Number DE95766688. Source: OSTI; NTIS.

Thermal conductivity has been measured by SP since 1965. This has provided a substantial data base of results, from which measurements for different groups of materials have ben compared in order to give an idea of normal variations and mean values. Values for polystyrene, glass fiber, and mineral wool have been statistically investigated. In general, it is the density dependence of the thermal conductivity that has been investigated, although air permeability as an indirect parameter has also been studied. The expression A + B*d + C/d has been employed to describe the thermal conductivity in a porous material, and has been found preferable to other types of polynomials. Systematic differences from the mean curve can be detected by employing the difference between the measured values and the theoretical values (the residual), which provides a means of detecting sub-standard (or super-standard) batches. 12 refs, 13 figs

15767 (UCRL-JC–120680) **Movement of outdoor particles to the indoor environment: An analysis of the Arnhem Lead Study.** Layton, D.W. (Lawrence Livermore National Lab., CA (United States)); Thatcher, T.L. Lawrence Livermore National Lab., CA (United States). Mar 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950646–15: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95010733. Source: OSTI; NTIS; GPO Dep.

This paper analyzes the role of soil tracking as a source of indoor particles and quantifies key parameters influencing the transport of soil-derived particles (resuspension rates for particulate matter on floors, deposition velocities of suspended particles in indoor and outdoor air). The paper begins with a brief review of studies of particle transport processes and presents a simple model for studying the transport of particles in the indoor environment. The model is used to examine data on Pb distributions in the indoor and outdoor environments of community adjacent to a secondary lead smelter.

3202 Transportation

Refer also to citation(s) 15691

15768 (ETDE-DE–77) **Determination of ship and weather dependent drag coefficients for the dimensioning of the main engine and the control of the engine and propeller load on the sea. Final report.** Grossmann, G. (comp.). Technische Univ. Berlin (Germany). Fachbereich 12 - Verkehrswesen; Technische Univ. Berlin (Germany). Inst. fuer Schiffs- und Meerestechnik. Dec 1991. 58p. (In German). Project Number ERP 2621. Order Number DE95769283. Source: OSTI; NTIS (US Sales Only).

The here applied method uses the marine screw propeller as measuring instrument for resistance changes. From ship's logs the mean of the entries of ship's velocity, fuel consumption, motor output and speed of rotation were evaluated in connection with weather and operating conditions. Moreover results of model tests, free-running diagrams of propellers as well as general ship data were used. Ship logs and data of 15 ships of different size were kindly put at our disposal by different German shipping companies. (orig./HW)

15769 (IEE-SR–243) **Modal shift and energy efficiency. Mainly on comparison between truck and railroad.** Institute of Energy Economics, Tokyo (Japan). Aug 1993. 181p. (In Japanese). Order Number DE95769734. Source: OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan.

A comparative study is made on energy efficiency between truck and railroad in cargo transportation. Discussions are developed in terms of zones of transport distance, transport to end users, detour distance caused by modal shift, energy consumption in construction of infrastructure, etc. As a result, in transportation between places excluding transport to end users, traveling energy consumption per transport weight x distance becomes 1.7-2.6 in truck versus 1 in railroad. In transportation including that to end users, no energy-saving effects of conversion to railroad are expected if the distance is short such as about 100-200 km, however advantages of the railroad become greater if the distance is far. Even in the short distance transportation, energy-saving effects are obtained which are comparable to those in the long distance one if including transport to end users when the mean speed is reduced to 30 km/hr, affected by the heavy traffic in the metropolitan area. Since indirect energy in railroad exceeds that in road by 40% on average, total energy/ton-km becomes 70-80 in railroad versus 100 in truck in consideration of this indirect energy. 37 refs., 113 tabs.

15770 (IEE-SR–259) **Analysis of energy consumption in car transportation. Actual status of district transportation (truck) in the metropolitan area, and influence of the NOx law.** Institute of Energy Economics, Tokyo (Japan). Aug 1994. 166p. (In Japanese). Order Number DE95764073. Source: OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan.

An investigation is conducted to know the actual status of truck transportation in the district (within the prefecture, within the district). The objective for the study is the metropolitan area. In case of comparing trucks with the same maximum load level in the district transportation, there is seen no big difference in loading rate, and it cannot be said that business-use trucks are higher in transport energy efficiency than private-use ones. The lower maximum load level the truck has, the lower the loading rate and energy efficiency become. Enhancement of energy efficiency is difficult in connection with distribution conditions. Notwithstanding the transport volume is decreasing, the traveling distance is not. The number of all the trucks retained remains almost unchanged, but the number of the trucks retained in the service business field increases stably. Accordingly, despite of the transport volume which has recently been reducing, the energy consumption has not decreased. Under regulations on car models by the NOx law, it is predicted that energy consumption in the metropolitan area increases in gasoline by 0.7 million kL and decreases in light oil by 0.5 million kL during a 8-9 year grace period, due to the shift from light oil. The energy consumption increases by 3%, affected by a decline in fuel consumption caused by the shift of car model. 34 refs., 74 figs., 108 tabs.

15771 (INEL–94/00023) **Lunar South Pole ice as heat sink for Lunar cryofuel production system.** Zuppero, A. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Stanley, M.; Modro, S.M.; Whitman, P. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950110–18: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95008612. Source: OSTI; NTIS; INIS; GPO Dep.

Recent Clementine bistatic radar data suggest that water ice may be present in a "forever shaded" depression or crater at the South Pole of the Moon. The ice is a feedstock for the electrolysis production of cryogenic oxygen and hydrogen rocket fuels for a transportation system on the moon and for leaving and descending on to the moon. The ice also provides a convective heat sink critical to the practical implementation of high throughput electric power generators and refrigerators that liquefy and cool the oxygen and hydrogen into cryogenic rocket fuel. This brief analysis shows that about a hundred tonnes of hardware delivered to the lunar surface can produce tens of thousands of tonnes of rocket fuel per

year, on the moon. And it makes the point that if convective cooling is used instead of radiative cooling, then power and processing systems can be used that exist and have been tested already. This shortens the time by an order of magnitude to develop lunar operations. Quick deployment of a chemical cryofuel energy source is a key factor in the economics of lunar development.

15772 (INEL–94/00134) **Very Light Rail (VLR) technology - a new, simple, safe, cost-effective environmental solution to meet future transportation needs.** Dearien, J.A. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Buehrer, M.S. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9504129–1: 1995 international symposium on public works and the human environment, Seattle, WA (United States), 19-21 Apr 1995). Order Number DE95008608. Source: OSTI; NTIS; GPO Dep.

An increasing number of papers, government programs, and studies, are directed toward the economics of lighter weight vehicles in mass transit. The objectives of these activities are generally directed toward the increased energy efficiency of the fighter vehicles or the benefits to the infrastructure-less wear, repair, or construction cost, or both. Some systems studies of potential magnetic levitation concepts have minimized the size of the vehicles in order to increase the operational flexibility of the system. CyberTran was designed and developed from the ground up as a small vehicle transportation system with the primary objectives of (1) reducing the capital and operating costs of high speed rail and transit systems and (2) maximizes rider appeal and safety. The potential for significant savings in capital cost with a small vehicle rail system like CyberTran has been evaluated. This paper discusses the operational benefits which can be realized with a rail system based on small, light weight, and computer controlled vehicles. CyberTran was developed at the Idaho National Engineering Laboratory, a U.S. Department of Energy Research and Development Laboratory in Southeastern Idaho.

15773 (ORNL/TM–12799) **Standards and conventions for the Worldwide Port System (WPS) regional Integrated Cargo Database (ICDB).** Loftis, J.P. (Oak Ridge National Lab., TN (United States)); Truett, L.F.; Shipe, P.C.; Faby, E.Z.; Fluker, J.; Grubb, J.W.; Hancock, B.R.; Ferguson, R.A. Oak Ridge National Lab., TN (United States). 28 Feb 1995. 72p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008693. Source: OSTI; NTIS; GPO Dep.

This document, prepared for the Worldwide Port System (WPS) Regional Integrated Cargo Database (ICDB), provides standards and conventions for the screens developed using ORACLE's SQL*Menu, SQL*Forms, and SQL*Reportwriter; for the ORACLE keys; and for commenting ORACLE code. It also covers standards for database system transfers. The results of adherence to these standards and conventions by all developers at both geographically separated development sites, Oak Ridge National Laboratory (ORNL) and The Military Traffic Management Command's Eastern Area (EA), will be a consistent appearance of ICDB to users, code that is easily maintained, and a system that will be quicker to develop and integrate. This final report of the Standards and Conventions contains general guidelines to be followed for the development of the ICDB user interface screens. Though additional ICDB user interface screens are being developed both at ORNL and EA, and existing screens may have fields added to or deleted from them, the standards and conventions presented in this document should remain unchanged.

15774 (UCRL-ID–118775) **NASA FBL/PBW Program. NASA Boeing 757 HIRF test plan: Low power on-the-ground tests.** Poggio, A. (Lawrence Livermore National Lab., CA (United States)); Zacharias, R.; Pennock, S.; Avalle, C.; Sharpe, R.; Kunz, K.; Meissner, C. Lawrence Livermore National Lab., CA (United States). 7 Oct 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010416. Source: OSTI; NTIS; GPO Dep.

The NASA Fly-by-Light/Power-by-Wire (FBL/PBW) program was initiated to develop technology for a future generation of commercial transport aircraft. Studies have shown that an all-electric aircraft (PBW) could have substantial benefits in terms of weight and maintenance costs over today's aircraft that rely on hydraulic and pneumatic controls. However, one major concern regarding the all-electric aircraft is the potential for conducted and radiated electromagnetic susceptibility of its electronic controls. A way to potentially alleviate this problem (and save weight at the same time) is to route all control and signal information over optical fiber control links (FBL) that are inherently easier to harden against the electromagnetic environment (EME). Since electro-optic devices and electronic digital computers will still be required, a major objective of the FBL/PBW program is to develop tools and techniques for assessing the survivability of the modern aircraft using such equipment in the electromagnetic environment. The EME effects assessment tools and techniques developed under the program must ultimately be accepted by industry and the FAA regulatory body to be useful. Therefore, an important aspect of the program is that these tools and techniques must be validated to the satisfaction of this community. A series of aircraft tests are being planned for this purpose. Specifically, low power on-the-ground tests and fly-by tests will be conducted. This test plan describes, in detail, the on-the-ground tests which include those used for generating data for code validation as well as those which support the study of the stirred frequency technique. The test plan for the fly-by tests will be provided in a subsequent document.

3203 Industrial and Agricultural Processes

Refer also to citation(s) 14752, 15247, 15257, 15666, 16194, 16298, 16331, 16462, 16521, 16580, 17384

15775 (ANL/CHM/CP–84094) **Conversion of holes into reducing species on surface modified small-particle TiO_2.** Micic, O.I. (Argonne National Lab., IL (United States). Chemistry Div.); Ostafin, A.E.; Rajh, T.; Sabelko, J.J.; Thurnauer, M.C.; Tiede, D.M.; Zhang, Y. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950241–3: 5. international symposium on chemical oxidation, Nashville, TN (United States), 15-17 Feb 1995). Order Number DE95008282. Source: OSTI; NTIS; GPO Dep.

Complexation of colloidal titanium dioxide nanoparticles (40 Å) by cysteine as a surface derivative was investigated by electron paramagnetic resonance (EPR) and infra-red (diffusion reflectance infra-red Fourier Transform DRIFT) spectroscopies. It was found that cysteine strongly binds to the colloid surface. The authors have demonstrated with EPR spectroscopy that cysteine modifies the TiO_2 surface with formation of new trapping sites where photogenerated electrons and holes are localized. Illumination of cysteine modified TiO_2 at 77K resulted in formation of a sulfur centered radical observed by EPR spectroscopy at 200 K. Upon addition of lead ions, a new complex of cysteine that bridges surface titanium atoms and lead ions was detected by IR spectroscopy. Illumination of lead/cysteine modified TiO_2 did not result in the formation of sulfur centered radical, but symmetrical, lattice defect type EPR signal for trapped holes was observed. However, addition of methanol to this system resulted in the formation of $\cdot CH_2OH$ radical following illumination at 8.2 K. After the temperature was raised to 120 K, doubling of the signal associated with electrons trapped at particle surface ($Ti(3)_{surf}$) was observed. On further increase of the temperature to 200 K the EPR signal for trapped electrons disappeared as a result of the reduction of Pb^{2+} ions, and metallic lead was observed to precipitate. Conversion of photogenerated holes into trapped electrons due to the presence of methanol doubles the yield of trapped electrons that can reduce Pb^{2+}. Direct reduction of Pb^{2+} ions by $\cdot CH_2OH$ radical on TiO_2 was not detected.

15776 (CRIE-U–94004) **Development of hydroponic system using agriculture waste. 1. Characteristics of rice husk charcoal as growth medium and vegetable growth.** Terazoe, H. (Central Research Institute of Electric Power Industry, Tokyo (Japan)); Nakaya, K.; Okano, T. Central Research Inst. of Electric Power Industry, Tokyo (Japan). Jun 1994. 31p. (In Japanese). Order Number DE95769742. Source: OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan.

Experimental researches were made on rice husk charcoals processed to be used as culture media for hydroponics. Rice husk charcoals with a size of 1 mm or larger retaining the original shape of the rice husk, and with a size of smaller than 1 mm were made for use in the experiment. In the culture media made of these rice husk charcoals, the charcoal with a particle size greater than 1 mm had more air portion than water portion at 6 cm above the water level, and the charcoal with a particle size smaller than 1 mm had poor air permeability. According to the result of immersing the rice husk charcoal in a culture solution, phosphoric acid ion and manganese in the solution decreased by about 35% and calcium by about 10% in the duration of 120 minutes, as a result of having been adsorbed into the rice husk charcoal. On the other hand, chloride ion increased by about 80% and potassium and iron by about 30%, because of having been dissolved out from the charcoal. In cultivating spinach, butterhead lettuce and radish in the rice husk charcoal culture media, the culture medium with charcoal smaller than 1 mm resulted in harvest reduced by about 75% in spinach, and about 10% in butterhead lettuce. 15 refs., 13 figs., 11 tabs.

15777 (DOE/AL/99286–T5) **Environmentally conscious manufacturing-technology access project: Technical progress report, April 1, 1994–March 30, 1995.** Maine Metal Products Association, Portland, ME (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-94AL99286. Order Number DE95010541. Source: OSTI; NTIS; GPO Dep.

The Environmentally Conscious Manufacturing-Technology Access Project (ECM-TA Project) has developed into a highly respected provider of technical assistance to the metal products industry. It highlighted its first year of operation by receiving the Governor's award for Excellence in Pollution Prevention. The technical assistance program has trained teams of volunteers to conduct on-site ECM assessments and provides additional technical assistance through conferences, seminars, research and access to new technologies. These efforts are achieving the goals of helping these companies to become more competitive and efficient and becoming more environmentally friendly. The nine tasks under this program are described and progress to date on each is discussed. The tasks are: Administration of project; Industry needs opportunities assessment; Develop and maintain Assessment Team and Tech-Source Team; Coordinate ongoing program of basic ECM assessments; Develop and implement trial program of packaged technical assistance; Develop and administer ECM Technology Fund; Facilitate industry attendance at conferences, participation in study tours, and exchange of ideas; Establish ECM Clearinghouse; and Provide worker training in ECM.

15778 (DOE/CE/23810–51B) **Compatibility of refrigerants and lubricants with motor materials under retrofit conditions.** Doerr, R. (Trane Co., La Crosse, WI (United States)); Waite, T. Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States); Trane Co., La Crosse, WI (United States). 12 Jan 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. Order Number DE95010185. Source: OSTI; NTIS; GPO Dep.

Motor materials were exposed to original refrigerants R-11, R-12, R-22 and R-502 in the presence of mineral oil for 500 hours. These same materials were then exposed to alternative refrigerants R-123, R-134a, R-407C (R-32/R-125/R-134a) and R-404A (R-125/R-143a/R-134a), respectively, in the presence of the appropriate lubricant for 500 hours. As a control, some samples were exposed to the original refrigerant/mineral oil for a total of 1,000 hours. These tests were conducted to determine whether exposure to the original refrigerant/mineral oil would affect compatibility of the motor materials with the alternative refrigerant/lubricant after retrofit. Motor materials exposed to the alternative refrigerant and lubricant (after an initial exposure to the original refrigerant and mineral oil) appeared to be compatible with the alternative refrigerant and lubricant. The only concerns were embrittlement of the polyethylene terephthalate (PET) sheet and sleeving insulations, and delamination and blistering of the Nomex sheet insulation in the R-22, R-502, and R-12. Embrittlement of the PET materials was attributed to moisture present during the exposure. Separation of the 475 varnish from metal surfaces in the R-123 was also a concern. The sheet and sleeving insulations were affected by the original refrigerant/mineral oil to a greater extent than by the alternative refrigerant and lubricant.

15779 (DOE/GO–10095-097) **Office of Industrial Technologies: Industry partnerships.** National Renewable Energy Lab., Golden, CO (United States). Apr 1995. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94006881. Source: OSTI; NTIS; GPO Dep.

US industries are making progress in turning the vision of the future into reality: More effective competition in global markets, increased industrial efficiency, more jobs, reduced waste generation and greenhouse gas emissions (to 1990 levels), improved environment. DOE's Office of Industrial Technologies is catalyzing and supporting industry progress in many ways. This pamphlet gives an overview of OIT.

15780 (DOE/PC/91161–T10) **A coal-fired combustion system for industrial process heating applications. Quarterly technical progress report, July 1994–September 1994.** Vortec Corp., Collegeville, PA (United States). Dec 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91161. Order Number DE95010367. Source: OSTI; NTIS; GPO Dep.

PETC has implemented a number of advanced combustion research projects that will lead to the establishment of a broad, commercially acceptable engineering data base for the advancement of coal as the fuel of choice for boilers, furnaces, and process heaters. Vortec Corporation's Phase III development contract DE-AC22-91PC91161 for a "Coal-Fired Combustion System for Industrial Process Heating Applications" is a project funded under the DOE/PETC advanced combustion program. This advanced combustion system research program is for the development of innovative coal-fired process heaters which can be used for high temperature melting, smelting and waste vitrification processes. The process heater systems to be developed have multiple use applications; however, the Phase III research effort is being focused on the development of a process heater system to be used for producing value added vitrified glass products from boiler/incinerator ashes and industrial wastes. The primary objective of the Phase III project is to develop and integrate all the system components, from fuel through total system controls, and then test the complete system in order to evaluate its potential marketability.

15781 (ENEA-RT-INN–94-04) **Activated carbon adsorption for chromium treatment and recovery.** Baroncelli, F. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Castelli, S.; De Francesco, M. ENEA, Casaccia (Italy). Area Energia e Innovazione. May 1994. 17p. (In Italian). (RT/INN–94-04). Order Number DE95771021. Source: OSTI; NTIS (US Sales Only).

The capability of actived carbon systems to adsorb chromium from wastewater of galvanic industry is valued. Batch tests and column tests are carried out with good results. An activated carbon with acidic surface oxides can adsorb both chromate and chromium (III); chromate is reduced in situ and then adsorbed as chromium (III). Chromium can be desorbed from carbon by an acid or basic treatment obtaining respectively chromium (III) or chromate solutions. Carbon can be regenerated many times without evident signs of deterioration.

15782 (ETDE-DE–78) **Accompanying program for the development of small gas generator devices. Final report.** Gerhardt, C. Deutsche Gesellschaft fuer Technische Zusammenarbeit GmbH (GTZ), Eschborn (Germany). 29 Apr 1992. 18p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326583B. Order Number DE95769269. Source: OSTI; NTIS (US Sales Only).

The aim of the accompanying program was to establish the requirements which can be derived from future conditions of use of small-scale gas generators. The results of this program were used in the main project in order to optimize the product and to adapt it to future conditions of use in developing countries and to reduce thus the risk of failure in field tests and operations. The following aims were attained: 1. Analysis of weak points for existing and

former gas generator systems is carried out. 2. International exchange of experience is brought in. 3. Fields of application, target groups and conditions of the surroundings are defined and delimited. 4. Prerequisites for dissemination measures for small-scale gas generators are defined. (orig.)

15783 (ETDE-DE–85) **Rational use of energy in electrochemical processes especially in the field of electroplating. Final report.** Hartmann, M. Gesellschaft fuer Technische Studien, Entwicklung, Planung mbH (SEP), Muenchen (Germany). Jul 1994. 293p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326945A. Order Number DE95769903. Source: OSTI; NTIS (US Sales Only).

The project was carried out to quantify the energy saving potential in electroplating processes. Emphasis was laid on the investigation of the energy saving potential for the treatment and recycling of process solutions including additional means to eliminate unwanted reaction products. Conventional approved methods for the removal of cyanides consume a high amount of energy and the recycling of highly concentrated process solutions is problematic. For that reason practical tests on that field have been carried out in order to investigate the application potential for electrochemical processes applying both of the following methods: - thermal hydrolysis for the destruction of cyanides, - membrane distillation for the treatment of process solution. Operational tests have been carried out successfully on both methods and the conditions for economic plant operation have been determined. (orig.)

15784 (KCP–613-5539) **Urethane foam process improvements. Final report.** Watson, D.R. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Mar 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95008957. Source: OSTI; NTIS; GPO Dep.

A study was completed to evaluate the foam molding process for environmental and technical improvements. The investigation led to a replacement for chlorinated solvent usage, a potential permanent mold release coating, improved tooling design, and shrinkage characterization of foams filled with varying levels of aluminum oxide.

15785 (NEI-DK–1878) **Plus-energy agriculture. Phase I.** Tybirk, E. Nordvestjysk Folkecenter for Vedvarende Energi, Hurup (Denmark). Nov 1994. 28p. (In Danish). Contract ENS-UVE-90.0178. Order Number DE95766508. Source: OSTI; NTIS.

The aim was to develop simple techniques in relation to energy-producing, non-pollutive, and yet highly productive family-farming based on a combination of agriculture and aquaculture (dike-ponds). Through maximum use of solar energy, and of all available waste products, an environmentally friendly system is established. This system produces more energy than can be used, in the form of fossil fuels, fodder and other necessaries. The aim of the project was also to document that the system's production of foodstuffs is 4-5 times higher than that resulting from traditional Danish farming methods. The dike-pond system (originating from China) and its construction during the carrying out of the project is described. The overall family-farming system is based on the conversion of manure slurry from 4 large pigs and 1 cubic meter of household sewage daily. It is aimed to produce biomass, protein and clean water from the manures and sewage, to produce energy from methane derived from a biomass conversion plant, plants for fodder and also to supply organic fertilizers from fish excrement. During a period of six months, 20 kg of carp flesh for human consumption can be produced by feeding the fish with pig manure - in addition to water plants providing 20-30% of the necessary pig fodder. (AB) (13 refs.)

15786 (NEI-DK–1895) **Branch analysis of energy for slaughterhouses. Main report.** Koedbranchens Faellesraad, Aarhus (Denmark); Danske Salgterier, Copenhagen (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Distributionsudvalget; Slagteriernes Forskningsinstitut, Roskilde (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Nov 1994. 120p. (In Danish). Order Number DE95766496. Source: OSTI; NTIS.

The aim was to promote energy saving initiatives in slaughterhouses and to develop cheaper methods of energy auditing for the benefit of consultants in this field. The production, process flow and energy consumption are described and areas where it would be possible to reduce energy consumption or recover energy from waste heat are identified. The Danish firms of SYD, IVERSEN-DANE BEEF, TULIP INTERNATIONAL and VESTJYSKE SLAGTERIER's slaughterhouse in Holstebro were chosen for investigation. Recommendations are given with regard to energy surveys of the whole branch and key figures are presented as a basis for comparison with other firms within this branch. Suggestions are given as to where energy consumption could be cut down for example by reducing the amount of surplus condensation heat and installing containers for storage and following reuse of surplus hot water from the production process for cleaning purposes This could save 407 MWh annually. Other suggestions are given as to how to save energy in slaughterhouses. (AB)

15787 (NEI-DK–1896) **Branch analysis of energy for slaughterhouses. Working report. Iversen-Dane Beef. Bylderup Bov department.** Koedbranchens Faellesraad, Aarhus (Denmark); Danske Salgterier, Copenhagen (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Distributionsudvalget; Slagteriernes Forskningsinstitut, Roskilde (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Jan 1995. 54p. (In Danish). Order Number DE95766497. Source: OSTI; NTIS.

A detailed analysis of the Bylderup Bov department of the Danish firm IVERSEN-DANE BEEF. The firm itself, its production and the nature of its energy consumption are described. The technological processes are examined in order to identify possible ways of saving energy, especially with regard to lighting systems, compressed air, ventilation and heating systems. It is reckoned that the slaughterhouse can save 24% of total bought energy consumption, 5% of electricity consumption and 39.7 of natural gas consumption. a summary of this report is found in the main report entitled 'Branch analysis of energy in slaughterhouses'. (AB)

15788 (NEI-DK–1897) **Branch analysis of energy for slaughterhouses. Working report. Tulip International A/S. Minced meat division.** Koedbranchens Faellesraad, Aarhus (Denmark); Danske Salgterier, Copenhagen (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Distributionsudvalget; Slagteriernes Forskningsinstitut, Roskilde (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Nov 1994. 76p. (In Danish). Order Number DE95766498. Source: OSTI; NTIS.

A detailed analysis of the minced meat division of the Danish firm TULIP INTERNATIONAL A/S. The firm itself, its production and the character of its energy consumption are described in addition to the technological processes it employs. General ways only of saving energy mostly in relation to, for example, compressed air, ventilation and heating systems are suggested. It is reckoned that this firm could save 18.6% of bought energy, 6.6% of electricity consumption and 24.8% of natural gas consumption. A summary of this report is found in the main report entitled 'Branch analysis of energy in slaughterhouses'. (AB)

15789 (NEI-DK–1898) **Branch analysis of energy for slaughterhouses. Working report. Slagteri Syd. Blans dept.** Koedbranchens Faellesraad, Aarhus (Denmark); Danske Salgterier, Copenhagen (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Distributionsudvalget; Slagteriernes Forskningsinstitut, Roskilde (Denmark); Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark). Nov 1994. 85p. (In Danish). Order Number DE95766499. Source: OSTI; NTIS.

A detailed analysis of a slaughterhouse in Blans owned by the Danish firm 'Slagteri SYD' in order to identify possibilities for reducing energy consumption. The firm itself, the nature of its production and energy consumption are described in addition to the technological processes utilized. It is reckoned that the firm could save 16% of total bought energy consumption, 9.8% of electricity consumption and 29% of fuel-oil consumption. A summary of this report is included in the main report entitled 'Branch analysis of energy in slaughterhouses'. (AB)

15790 (NEI-DK–1903) **Branch analysis of energy for the Danish timber industry.** Dk-TEKNIK, Aalborg (Denmark). Energi og Miljoe. Oct 1993. 63p. (In Danish). Order Number DE95766492. Source: OSTI; NTIS.

The results of a branch analysis of energy consumption and potentials for energy conservation within the timber industry are described in detail. 5 firms were examined and it was concluded that savings could be achieved in relation to lighting systems, compressed air, moisturizing of air, suction of varnish and the production and distribution of heat. The investigation is incomplete because certain relevant technologies are as yet undeveloped. (AB)

15791 (NEI-DK–1907) **Branch analysis of energy. Graphic Association Denmark. Main report.** Grafisk Arbejdsgiverforening. Odense (Denmark). Mar 1994. 94p. (In Danish). Order Number DE95766490. Source: OSTI; NTIS.

An analysis of energy consumption within the Danish graphic industry excluding serigraphy and book-binding. It is based on an investigation of energy use in seven graphic firms which are representative for the industry: Aller Press, Fyens Stifttidende, JP-tryk, Kohn Group, Levison + Johnson + Johnson, PLM-Haustrup and Schouw Packing. Case reports are found in a supplementary document of the same title. An aim was to help graphic firms find means of saving energy which it would pay them to carry out and to provide a framework for the process of energy surveying. Energy consumption varies considerably within this branch and depends on the type of product and on the processes used. 40-60% of energy utilized is in the form of electric power and the rest is covered by use of oil, natural gas and district heating. The greatest potentials for saving energy were found to be the reduction of idling in the case of printing machines and connected equipment (saves 40-50% annual energy consumption), more efficient ventilation systems, energy conservation in the case of drying and pressing processes, and also of idleness in this area, and a more efficient use of compressed air and cooling systems as these processes use 20% of total energy consumption and do not currently operate satisfactorily. It is reckoned that the use of electricity could be decreased by 15%, and that in the case of each firm 5-15% of total energy consumption could be saved. (AB)

15792 (NEI-DK–1908) **Branch analysis of energy. Graphic Association Denmark. Supplementary report.** Grafisk Arbejdsgiverforening, Odense (Denmark). Feb 1994. 86p. (In Danish). Order Number DE95766491. Source: OSTI; NTIS.

This supplementary report to the main one of the same title gives detailed information on how to save energy in the cases of individual firms within the Danish graphic industry. (AB)

15793 (NEI-DK–1957) **Energy analysis at Kemira's nitric acid plant. Demonstration of the pinch method.** Weel Hansen, M.; Sandvig Nielsen, J. Dk-TEKNIK, Soeborg (Denmark). Energi og Miljoe. 1991. 80p. (In Danish). Contract ENS-1223/89-2. Order Number DE95772369. Source: OSTI; NTIS.

EFP-89.

The aim was to evaluate the usefulness of the Pinch method (a method of achieving the optimal use of energy) in relation to industrial processes by trying it out at a Danish firm. The principles on which the Pinch method is based are explained and its application in a study of energy efficiency at KEMIRA's nitric acid plant (nr. IV) is described. Here energy economy was investigated, based on the choice of components, energy consumption, and investments in processing facilities. The nitric acid production process and the application of the Pinch method to this process are depicted, and the potential for optimal usage of energy is determined. Suggestions for the design of a completely new plant are given and possibilities for incresing production at the existing plant are debated. It was concluded that the Pinch method was satisfactory in use, its main virtue being that an estimation of realistic energy-efficient goals can be arrived at very speedily. This results in the build-up of further motivation for reaching them. (AB)

15794 (NEI-DK–1979) **Branch analysis of energy for the packing industry.** Ramboell, Hannemann og Hoejlund A/S, Copenhagen (Denmark). Nov 1993. 33p. (In Danish). Order Number DE95772380. Source: OSTI; NTIS.

The aim was to make it possible for firms within the packaging industry to find means of saving 80% of their total energy consumption quickly. The six firms examined were: Henriksen and Blom, Assi Emballage A/S, Danapak Flexible, Konvolutfabrikken Danmark, Joensen/Kruckow-Waldorff I/S and Unibag, Dansk Pose-Industri A/S. These firms are described in detail and areas where energy could be saved are identified. The main recommendations are to regulate operational times and quality of lighting and ventilation systems and compressed air facilities more precisely to actual needs, to mount cut-off valves to compressed air and cooling systems when production machines are closed down, to use suction ventilation directly over processes that pollute indoor air and thus reduce general ventilation needs, to control leakage of compressed air regularly, to reduce machine idleness generally, to keep boilers clean and to upgrade boiler maintenance standards. (AB)

15795 (PNL–9344) **Impact evaluation of a mill tailings thickener installed at J.R. Simplot Company's Smoky Canyon Mine under the Energy $avings Plan.** Brown, D.R.; Spanner, G.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95007807. Source: OSTI; NTIS; GPO Dep.

This report describes Pacific Northwest Laboratory's (PNL's) evaluation of the impact of an energy conservation project completed in the fall of 1992. The project (a mill tailings thickener) was installed at J.R. Simplot Company's (Simplot's) Smoky Canyon Mine in Caribou County, Idaho near Afton, Wyoming. The project at Simplot is one in a continuing series of industrial energy conservation projects to have its impact evaluated by PNL. All of the projects have received or will receive acquisition payments from the Bonneville Power Administration (Bonneville) under the Energy $avings Plan (E$P) Program. The E$P is being offered to reduce electricity consumption in the industrial sector of Bonneville's service territory. For the Simplot project, the acquisition payment offered under the program was equal to the lesser of 10¢/kilowatt-hour (kWh) saved in the first year or 80% of eligible project costs, up to a limit of $250,000. The general objective of the impact evaluation was to determine how much electricity is saved by the project and at what cost to Bonneville and to the region.

15796 (SAND–94-2565C) **A phenomenological finite element model of part building in the stereolithography process.** Chambers, R.S.; Guess, T.R.; Hinnerichs, T.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9506149–2: 6. international conference on rapid prototyping, Dayton, OH (United States), 4-6 Jun 1995). Order Number DE95008437. Source: OSTI; NTIS; GPO Dep.

The finite element method has been used to develop the framework for a tool that can be used to model the structural deformation arising from the stereolithography build process. Such a tool when fully developed can facilitate numerical studies aimed at evaluating build parameters and build styles. Although the current software makes no attempt to capture all the physics of the process, provisions for three important build features have been made: (1) laser path history including scanning rate and depth of cure, (2) structural linkage, and (3) time varying material behavior. For demonstration purposes, a three dimensional finite element code was modified to include a phenomenological material model of solidification. The model was based on cure shrinkage and stress relaxation data collected from in-situ tests on individual strands drawn using 3D Systems' stereolithography apparatus (SLA-250). To depict the directed path of solidification within layers, a finite element birthing scheme was conceived to activate elements along the predetermined coordinate path of the laser. Structural linkage was enforced by joining element strands of layers when laser paths connect or overlap, respectively. A limited number of analyses have been performed to contrast simple build styles.

15797 (SAND–95-0609C) **Vibration control for precision manufacturing at Sandia National Laboratories.** Hinnerichs, T. (Sandia National Labs., Albuquerque, NM (United States). Structural Dynamics and Vibration Control Dept.); Martinez, D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC04-94AL85000. (CONF-950228–5: North American conference on smart structures and materials, San Diego, CA (United States), 26 Feb - 3 mar 1995). Order Number DE95009582. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories performs R and D in structural dynamics and vibration suppression for precision applications in weapon systems, space, underwater, transportation and civil structures. Over the last decade these efforts have expanded into the areas of active vibration control and "smart" structures and material systems. In addition, Sandia has focused major resources towards technology to support weapon product development and agile manufacturing capability for defense and industrial applications. This paper will briefly describe the structural dynamics modeling and verification process currently in place at Sandia that supports vibration control and some specific applications of these techniques to manufacturing in the areas of lithography, machine tools and flexible robotics.

15798 (WHC-MR–0489) **Glass science tutorial: Lecture No. 4, commercial glass melting and associated air emission issues.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007818. Source: OSTI; NTIS; INIS; GPO Dep.

This document serves as a manual for a workshop on commercial glass melting and associated air emission issues. Areas covered include: An overview of the glass industry; Furnace design and construction practices; Melting furnace operation; Energy input methods and controls; Air legislation and regulations; Soda lime emission mechanisms; and, Post furnace emission controls. Supporting papers are also included.

3206 Municipalities and Community Systems

Refer also to citation(s) 15240, 15246, 15278, 15372, 15625, 15686, 15690, 15695, 15712, 15744

15799 (CTH-PUBL–93-8, pp. 81-92) **Evacuated powder insulation for district heating applications.** Torstensson, H. (Fjaerrvaermeutveckling FVU AB, Nykoeping (Sweden)); Zinko, H. Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The use of CFC-containing foam for insulation purposes will be completely stopped within a year or two. Therefore, the use of alternative, environmentally acceptable insulation techniques are of great interest even for district heating applications. In this paper, a new solution based on evacuated fine powder in combination with conventional CFC-free foam is outlined. Of the powder tested, fine-grained kiselguhr and opacified aerogel have been found to show the lowest thermal conductivities, i.e. 0.004 and 0.007 W/(m K) respectively, at a pressure of 1 kPa (0.01 mbar) and a temperature of 75 degrees C. The system design foresees using this powder in the so called CPC - coffee parcel concept, that is; suitably shaped parcels made by diffusion tight plastic laminate foils, filled with powder and then evacuated, are placed in the space between the water pipe and the outer jacket pipe. They are kept in place, bounded and protected by means of polyurethane foam which is expanded into the space between the packages and also applied as a bounding material near the walls of the inner and outer pipes. In this way, a pre-insulated district heating pipe with an effective thermal conductivity of around 0.015 W/(m K) can be achieved. The paper describes technological as well as economical considerations for the CPC technology. 6 refs, 7 figs, 1 tab

15800 (GAO/RCED–94-200) **Energy potential of municipal solid waste is limited.** General Accounting Office, Washington, DC (United States). Resources, Community and Economic Development Div. Sep 1994. 28p. Sponsored by General Accounting Office, Washington, DC (United States). Source: OSTI; U.S. General Accounting Office, P.O. Box 6015, Gaithersburg, MD 20884-6015.

Energy recovery from municipal solid waste has the potential for making only a limited contribution to the nation's overall energy production. Although the current contribution of waste-derived energy production is less than one-half of 1 percent of the nation's total energy Supply, DOE has set a goal for energy from waste at 2 percent of the total supply by 2010. The industry's estimates show a smaller role for waste as an energy source in the future. The energy potential from waste is limited not only by the volume and energy content of the waste itself, but also by the factors affecting the use of waste disposal options, including public opposition and the availability of financing. Energy production from waste combustors and from landfill gases generates pollutants, although these are reduced through current regulations that require the use of emissions control technology and define operational criteria for the facilities. Although DOE estimates that one-third of the energy available from waste is available in the form of energy savings through the recycling of materials, the Department's research in this area is ongoing.

15801 (NEI-DK–1974) **Recycling. Trends in development and integration of recycling in waste management in Europe.** Larsen, I. Miljoestyrelsen, Copenhagen (Denmark). 1994. 32p. (CONF-950184–1: ISWA's international conference on recycling, Taipei (China), 12 Jan 1995). Order Number DE95772373. Source: OSTI; NTIS.

The paper, presented at the International Solid Wastes and Public Cleansing Association's (ISWA) international conference on recycling held on January 12th, 1995 at Taipei, Taiwan R.O.C. discusses trends in the development and integration of recycling in waste management in various European countries. It is claimed that recycling is becoming a more dominant element in the countries' waste policies and strategies. Subjects discussed are problems related to traditional recycling, sorting of household wastes, source sorting and kerb side collection of household wastes, volume reduction and packaging, producer responsibilities, demolition and building wastes, industrial and commercial wastes, general European waste policies and recycling as a form of energy recovery. (AB)

3209 Education and Public Relations

15802 (DOE/ER/75758–T1) **Green Street™: A comprehensive urban energy and environmental exhibit and education project. Final report, September 1, 1992–August 31, 1994.** Hamilton, P. Minnesota Science Museum, St. Paul, MN (United States). 31 Aug 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER75758. Order Number DE95010169. Source: OSTI; NTIS; GPO Dep.

Goals of the exhibit and education project were to: help audiences see the flows of energy and materials in a city, encourage people to practice energy conservation and environmental improvement steps, provide high school students with environmental science education opportunities, provide people with access to local energy and environmental organizations interested in urban environmental issues, deliver energy and environmental information to audiences that cannot visit the Science Museum of Minnesota, and use the museum as a model to demonstrate energy conservation techniques and alternative energy technology. Green Street publicity in print, TV/radio, etc., are listed.

33 ADVANCED PROPULSION SYSTEMS

3301 Internal Combustion Engines

Refer also to citation(s) 14774

15803 (DOE/MC/29257–95/C0452) **Allison engine testing CMSX-4® single crystal turbine blades and vanes.** Burkholder, P.S. (Allison Engine Co., Indianapolis, IN (United States)); Thomas, M.C.; Frasier, D.J.; Whetstone, J.R.; Harris, K.; Erickson, G.L.; Sikkenga, S.L.; Eridon, J.M. Allison Engine Co., Indianapolis, IN (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC29257. (CONF-950463–1: 3. international Charles Parsons turbine conference: materials engineering in turbines and compressors,

Newcastle upon Tyne (United Kingdom), 25-27 Apr 1995). Order Number DE95010308. Source: OSTI; NTIS; GPO Dep.

A team approach utilizing simultaneous engineering has been used to develop CMSX-4 turbine airfoil components. CMSX-4 is a nickel-base single crystal superalloy containing 3% (wt) rhenium and a high 71% volume fraction of coherent γ' precipitate strengthening phase. The high level of balanced properties determined by extensive laboratory evaluation has been confirmed during engine testing the Allison AE 2100 and AE 301X engines, with the post-test condition of the components, including advanced Castcool™ vane segments, being excellent. Also uncooled vane segments in CMSX-4 have exceeded engineering expectations.

15804 (DOE/METC/C–95/7183) **Achieving improved cycle efficiency via pressure gain combustors.** Gemmen, R.S. (US-DOE Morgantown Energy Technology Center, WV (United States)); Janus, M.C.; Richards, G.A.; Norton, T.S.; Rogers, W.A. USDOE Morgantown Energy Technology Center, WV (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). (CONF-950629–2: ASME international gas turbine and aeroengine congress and exposition: land, sea and air, Houston, TX (United States), 5-8 Jun 1995). Order Number DE95008945. Source: OSTI; NTIS; GPO Dep.

As part of the Department of Energy's Advanced Gas Turbine Systems Program, an investigation is being performed to evaluate "pressure gain" combustion systems for gas turbine applications. This paper presents experimental pressure gain and pollutant emission data from such combustion systems. Numerical predictions for certain combustor geometries are also presented. It is reported that for suitable aerovalved pulse combustor geometries studied experimentally, an overall combustor pressure gain of nearly 1 percent can be achieved. It is also shown that for one combustion system operating under typical gas turbine conditions, NO_x and CO emmissions, are about 30 ppmv and 8 ppmv, respectively.

15805 (ETDE-DE–67) **Development of administrative orders for implementation of the Noise Abatement Technical Code: Noise emission from combustion engine test stands.** Rapp, H. (Landesgewerbeanstalt Bayern (LGA), Nuernberg (Germany). Bereich Umweltschutz). Landesgewerbeanstalt Bayern (LGA), Nuernberg (Germany). Bereich Umweltschutz. Jul 1994. 210p. (In German). Sponsored by Umweltbundesamt, Berlin (Germany). Contract UFOPLAN 10503102/23. Order Number DE95768484. Source: OSTI; NTIS (US Sales Only).

The aim of this report is the determination of noise emission from combustion engine test stands. By means of examples there is given a summary of the sound radiation of test stands and their essential components. Methods of noise reduction are compiled and information on construction of a noise-reduced test stand is given. (orig.)

15806 (ETDE-DE–88) **Investigation of the influence of emulsion quality on HC-emission of Diesel engines. Final report.** Binder, K.; Wirbeleit, F.; Raab, A.; Lehner, W. No corporate text available. Oct 1989. 21p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT TV 8742A; Foerderkennzeichen BMFT TV 850 Order Number DE95770354. Source: OSTI; NTIS (US Sales Only).

By lowering the local temperature in the burning gas and by controlling the local air/fuel ratio by means of water addition to the fuel and injection into the combustion chamber in the form of a diesel/water emulsion, an NO_x decrease as well as reductions in black smoke emissions can be achieved. Since, at least lower loads and speeds this results in an increase in HC emissions, reductions in black smoke emissions do not involve the same effects on particulate emissions. This can be achieved, however, through fuel additive measures providing cetane numbers similar to those of diesel fuel. (orig./HW)

3303 Electric-Powered Systems

Refer also to citation(s) 15631

15807 (SAND–95-8222) **Energy storage and alternatives to improve train voltage on a mass transit system.** Gordon, S.P.; Rorke, W.S. Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010344. Source: OSTI; NTIS; GPO Dep.

The wide separation of substations in the Bay Area Rapid Transit system's transbay tunnel contributes to voltage sag when power demand is high. In the future, expansions to the system will exacerbate this problem by increasing traffic density. Typically, this situation is remedied through the installation of additional substations to increase the system's power capacity. We have evaluated the efficacy of several alternatives to this approach - specifically, installation of an 8 megajoule energy storage system, modification of the existing substations, or reduction of the resistance of the running rails or the third rail. To support this analysis, we have developed a simple model of the traction power system in the tunnel. We have concluded that the storage system does not have sufficient capacity to deal with the expected voltage sags; in this application, the alternatives present more effective solutions. We have also investigated the potential impact of these system upgrades on expected future capital outlays by BART for traction power infrastructure additions. We have found that rail or substation upgrades may reduce the need for additional substations. These upgrades may also be effective on other parts of the BART system and on other traction power systems.

3306 Vehicle Design Factors

Refer also to citation(s) 16121, 16298

15808 (ANL/ES/CP–85703) **Field assessment of an aluminum intensive passenger car.** Cuenca, R.M. Argonne National Lab., IL (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410256–5: Society of Automotive Engineers' convergence '94, Detroit, MI (United States), 18-27 Oct 1994). Order Number DE95008296. Source: OSTI; NTIS; GPO Dep.

Ford Motor Co. has made a small batch of "aluminum intensive vehicles" (AIV), consisting of mid-size cars (Taurus/Sable) with all-aluminum bodies. The first twenty vehicles were made for internal evaluation at Ford, but the second batch of twenty has been placed on the hands of selected independent users, primarily automotive suppliers, for long term field assessment. The mass reduction achieved in the body of an AIV is shown, and compared with an equivalent standard steel body. Argonne obtained one of these vehicles last October; this is an assessment of the fuel consumption and other operational characteristics of this type of car to date.

15809 (ANL/ES/CP–85704) **Analysis of the potential for new automotive uses of magnesium.** Stodolsky, F.; Gaines, L.; Cuenca, R.; Wu, S. Argonne National Lab., IL (United States). [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410309–2: Contractor's coordination meeting, Dearborn, MI (United States), 24-27 Oct 1994). Order Number DE95008297. Source: OSTI; NTIS; GPO Dep.

This paper describes the scope of a new project, just initiated, for the Lightweight Materials Program within the Office of Transportation Materials. The Center for Transportation Research and the Energy Technology Division at Argonne National Laboratory will assess the feasibility and technical potential of using magnesium and its alloys in place of steel or aluminum for automotive structural and sheet applications in order to enable more energy-efficient, lightweight passenger vehicles. The analysis will provide an information base to help guide magnesium research and development in the most promising directions.

3307 Emission Control

Refer also to citation(s) 15806

15810 (ANL/ET/CP–85237) **Alternative catalyst and exhaust gas sensor work at Argonne National Laboratory.** Iton, L.E.; Maroni, V.A.; Dieckman, S.L.; Sheen, S.H.; Raptis, A.C. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410256–4: Society of Automotive Engineers' convergence '94, Detroit, MI (United States), 18-27 Oct 1994). Order Number DE95007138. Source: OSTI; NTIS; GPO Dep.

Research programs at Argonne National Laboratory in the areas of automobile emissions monitoring and control are described. The mandate to improve automobile efficiency while reducing Pollution requires the development of new catalysts for exhaust emissions control that are capable of functioning efficiently under lean-burn engine operating conditions. It is also desirable that the use of expensive noble metal catalysts be avoided. NO_x emissions will not be efficiently controlled by the current three-way, supported noble metal catalysts under lean-burn conditions. New catalysts are being sought that could effect the selective catalytic reduction (SCR) of NO_x by exhaust hydrocarbons in the presence of oxygen. Molecular sieve zeolites of the ZSM-5 and ferrierite types, ion-exchanged with copper ions, are the best of the catalysts known to effect this chemistry, but the mechanism of the SCR is still not understood. In this project the authors will first undertake the investigation of the SCR of NO using model reactions to test postulated mechanistic pathways. Initial experiments have been devised to investigate the possible participation of metal alkyl complexes, metal oxime complexes, N-alkyl-N-nitroso-alkylaminato-metal complexes, and metal nitrile complexes in the zeolites. ANL will also develop microsensors, based on surface acoustic wave (SAW) chemical sensing techniques, and a micro mass-spectrometer (MS) for tailpipe or engine-out emission monitoring. The sensor configurations and sensing techniques of the proposed SAW and micro-MS are described.

15811 (KFB–92-265-742) **Exhaust gas catalysts for alcohol vehicles.** Pettersson, L.J. (Royal Inst. of Technology, Dept. of Chemical Engineering and Technology, Stockholm (Sweden)); Jaeraas, S.G. Swedish Transport and Communications Research Board, Stockholm (Sweden). Dec 1994. 62p. Order Number DE95766687. Source: OSTI; NTIS.

The objective for the project is to develop tailor-made exhaust gas catalysts for alcohol-fueled diesel vehicles in city traffic. The aim for the second phase was to increase the knowledge about important phenomena at low temperature oxidation of ethanol and acetaldehyde. Moreover, a basis for the selection and manufacture of a first full-scale catalyst sample for evaluation in engine tests was to be established. Catalytic oxidation of ethanol and acetaldehyde over catalysts applied on monolithic cordierite substrates was studied. Pt, Pd or mixtures were applied onto AlO, CeO2, SiO2, or TiO2 supports. The catalysts were evaluated in a quarts reactor in synthetic exhaust from ethanol-fueled diesel engines. The effect of support material on the low temperature oxidation of ethanol and acetaldehyde in the presence of NO and CO was investigated. The results indicate that the choice of support material influences the product distribution. Both Pt and Pd are active materials for ethanol oxidation, but the selectivity for total oxidation is low at temperatures below 250 deg C. The most important by-product is acetaldehyde, which is formed by oxidative dehydration of ethanol. The differences in acetic acid yields appear to be small between the Pt and Pd catalysts. We have however indications from full-scale tests which show that these differences can be significant for elimination of odor problems. There is clear evidence that acetic acid is not formed via oxidation of acetaldehyde at the experimental conditions. The report includes a literature survey on exhaust gas catalysts for vehicles fueled by ethanol, methanol or natural gas. 74 refs, 27 figs

3308 Alternative Fuels

Refer also to citation(s) 15244, 15261, 15811, 16506

15812 (DOE/BC/14971–2) **Liquid natural gas as a transportation fuel in the heavy trucking industry. Second quarterly progress report, October 1, 1994–December 30, 1994.** Sutton, W.H. Oklahoma Univ., Norman, OK (United States). Dept. of Aerospace and Mechanical Engineering. [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010376. Source: OSTI; NTIS; GPO Dep.

Studies aimed at using liquefied natural gas as a diesel fuel replacement are presented. Research concerning short and long term storage is discussed.

15813 (NREL/SP–420-5572-Rev.2) **BioFacts: Fueling a stronger economy, Ethanol from biomass. Revision 2.** National Renewable Energy Lab., Golden, CO (United States). Jan 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95010304. Source: OSTI; NTIS; GPO Dep.

Ethanol from biomass is a domestically produced liquid fuel from renewable, virtually inexhaustible domestic resources. It is a non-fossil transportation fuel that contributes little, if any, net carbon dioxide to the atmosphere during production and use. It is a high-octane fuel that can contribute substantially to the US automotive fuel supply. It is a fuel that can be used as a blend, a component of ethyl tertiary butyl ether (ETBE), or as a pure fuel, with excellent efficiency and performance. It is a potentially clean-burning fuel that reduces smog and emissions of carbon monoxide. This overview presents the resource potential, processing techniques, DOE program highlights, utilization potential and environmental effects of ethanol from biomass.

35 ARMS CONTROL

3502 Proliferation

15814 (ANL/ACTV–95/1) **APSTNG: Associated particle sealed-tube neutron generator studies for arms control. Final report on NN-20 Project ST220.** Rhodes, E.; Dickerman, C.E.; Brunner, T.; Hess, A.; Tylinski, S. Argonne National Lab., IL (United States). Dec 1994. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009651. Source: OSTI; NTIS; GPO Dep.

Argonne National Laboratory has performed research and development on the use of Associated Particle Sealed-Tube Neutron Generator (APSTNG) technology for treaty verification and nonproliferation applications, under funding from the DOE Office of Nonproliferation and National Security. Results indicate that this technology has significant potential for nondestructively detecting elemental compositions inside inspected objects or volumes. The final phase of this project was placement of an order for commercial procurement of an advanced sealed tube, with its high-voltage supply and control systems. Procurement specifications reflected lessons learned during the study. The APSTNG interrogates a volume with a continuous 14-MeV neutron flux. Each neutron is emitted coincident with an "associated" alpha-particle emitted in the opposite direction. Thus detection of an alpha-particle marks the emission of a neutron in a cone opposite to that defined by the alpha detector. Detection of a gamma ray coincident with the alpha indicates that the gamma was emitted from a neutron-induced reaction inside the neutron cone: the gamma spectra can be used to identify fissionable materials and many isotopes having an atomic number larger than that of boron. The differences in gamma-ray and alpha-particle detection times yield a coarse measurement of the distance along the cone axis from the APSTNG emitter to each region containing the identified nuclide. A position-sensitive alpha detector would permit construction of coarse three-dimensional images. The source and emission-detection systems can be located on the same side of the interrogated volume. The neutrons and gamma rays are highly penetrating. A relatively high signal-to-background ratio allows the use of a relatively small neutron source and conventional electronics.

3503 Verification

Refer also to citation(s) 16474, 16475, 16479

36 MATERIALS

Refer also to citation(s) 17387

15815 (ORNL/FMP–95/2) **Publications of the Fossil Energy Advanced Research and Technology Development Materials Program: April 1, 1993–March 31, 1995.** Carlson, P.T. (comp.). Oak Ridge National Lab., TN (United States). Apr 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009200. Source: OSTI; NTIS; GPO Dep.

The objective of the Fossil Energy Advanced Research and Technology Development (AR and TD) Materials Program is to conduct research and development on materials for fossil energy applications, with a focus on the longer-term needs for materials with general applicability to the various fossil fuel technologies. The Program includes research aimed at a better understanding of materials behavior in fossil energy environments and on the development of new materials capable of substantial improvement in plant operations and reliability. The scope of the Program addresses materials requirements for all fossil energy systems, including materials for coal preparation, coal liquefaction, coal gasification, heat engines and heat recovery, combustion systems, and fuel cells. Work on the Program is conducted at national and government laboratories, universities, and industrial research facilities. This bibliography covers the period of April 1, 1993, through March 31, 1995, and is a supplement to previous bibliographies in this series. It is the intent of this series of bibliographies to list only those publications that can be conveniently obtained by a researcher through relatively normal channels. The publications listed in this document have been limited to topical reports, open literature publications in refereed journals, full-length papers in published proceedings of conferences, full-length papers in unrefereed journals, and books and book articles. 159 refs.

3601 Metals and Alloys

Refer also to citation(s) 14882, 14934, 15039, 15305, 15391, 15404, 15405, 15407, 15408, 15409, 15410, 15411, 15412, 15413, 15414, 15415, 15416, 15417, 15418, 15419, 15420, 15421, 15422, 15423, 15424, 15425, 15426, 15458, 15582, 15606, 15607, 15727, 15728, 15803, 16050, 16130, 16210, 16248, 16257, 16267, 16268, 16297, 16330, 16335, 17030, 17031, 17048, 17198, 17199, 17200, 17201, 17204, 17205, 17208, 17210, 17211, 17212, 17213, 17214, 17215, 17216, 17217, 17218, 17219, 17220, 17221, 17222, 17223, 17224, 17225, 17227, 17237, 17259

15816 (ANL/MSD/CP–84769) **On the possibility of a two-state magnetic structure for nanocrystalline chromium.** Fitzsimmons, M.R. (Los Alamos National Lab., NM (United States). Manuel Lujan, Jr. Neutron Scattering Center); Robinson, R.A.; Eastman, J.A.; Lynn, J.W. Argonne National Lab., IL (United States); Los Alamos National Lab., NM (United States). Mar 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; W-7405-ENG-36. (CONF-950201–12: Annual meeting and exhibition of the Minerals, Metals and Materials Society (TMS), Las Vegas, NV (United States), 12-16 Feb 1995). Order Number DE95009914. Source: OSTI; NTIS; GPO Dep.

Wide-angle neutron diffraction measurements taken at temperatures from 6 to 250 K indicate that the portion of a chromium sample with a mean grain size of 73 nm is antiferromagnetically ordered at temperatures below 100 K. The Neel temperature (about 120 $\pm$ 10 K) for this nanocrystalline sample is suppressed considerably below that of strain-free single-crystal chromium (311 K). Similar measurements of other samples indicate that the amount of antiferromagnetic order decreases with decreasing grain size. The grain size dependence of antiferromagnetic order is discussed in the context of a two-state model.

15817 (CONF-9304146–4) **Anodically enhanced diffusion in Cu/Ag thin film couples.** Jones, D.A. (Univ. of Nevada, Reno, NV (United States). Chemical and Metallurgical Engineering); Jankowski, A.F. Nevada Univ., Reno, NV (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10891. From Alloy 600 experts meeting; Warrenton, VA (United States); 5-9 Apr 1993. Order Number DE95009198. Source: OSTI; NTIS; INIS; GPO Dep.

Thin, 100-nm films of first silver and then copper were deposited consecutively onto pure single-crystal (111) silicon substrates by magneton sputter deposition. Controlled anodic current density was applied at room temperature to dissolve the outer copper film to varying depths approaching the copper/silver interface. Profiles of copper and silver concentration vs. depth below the anodically dissolved surfaces were subsequently obtained by argon ion sputtering and simultaneous Auger Electron Spectroscopy. Despite some intrinsic mixing during the profile analysis, there is clear evidence that diffusion of copper and silver into one another is enhanced by anodic currents at the outer copper surface. Preliminary interpretation leads the authors to believe that the effect is caused by surface formation of vacancies during anodic dissolution. The anodically generated vacancies can migrate as divacancies to the copper/silver interface where they enhance diffusion by the usual vacancy exchange mechanism.

15818 (CONF-941144–108) **Mechanisms of enhanced ionic conduction at interfaces in ceramics.** Lubben, D.; Modine, F.A. Oak Ridge National Lab., TN (United States). Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009125. Source: OSTI; NTIS; GPO Dep.

A large enhancement in the ionic conductivity of certain compounds occurs when the compound is produced as a composite material containing a finely-dispersed non-conductor such as SiO_2 or Al_2O_3. This paper describes recent experiments which proposes that extended defects such as dislocations and grain boundaries, either resulting from or stabilized by the interface, are responsible for the enhancement. The ionic conductivities of LiI and CaF_2 thin films grown on sapphire(0001) substrates were monitored in-situ during deposition as a function of film thickness and deposition conditions. LiI films grown at 27°C exhibited a region of enhanced conduction within 100 nm of the substrate and a lesser enhancement as the film thickness was increased further. This conduction enhancement was not stable but annealed out with a characteristic log(time) dependence. The observed annealing behavior was fit with a model based on dislocation motion which implies that the increase in conduction near the interface is due to extended defects generated during the growth process. CaF_2 films grown at 200°C showed a behavior similar to the 27°C LiI films, with a region of thermally unstable enhanced conduction that occurs within 10 nm of the substrate. Amorphous Al_2O_3 films deposited over the CaF_2 layers created no additional enhancement but did increase the stability of the conduction, consistent with an extended defect model. Simultaneous deposition of CaF_2 and Al_2O_3 produced films consisting of very-fine-grained CaF_2 and particles of amorphous Al_2O_3 (5-10 nm grain and particle size) and a high defect density which was stable even well above the growth temperature. Measured conduction in the composite at 200°C was approximately 360 times that of bulk CaF_2.

15819 (CONF-941144–109) **Characterization of phosphorus segregation in neutron-irradiated pressure vessel steels by atom probe field ion microscopy.** Miller, M.K.; Jayaram, R.; Russell, K.F. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009129. Source: OSTI; NTIS; INIS; GPO Dep.

An atom probe field ion microscopy characterization of A533B and Russian VVER 440 and 1000 pressure vessel steels has been performed to determine the phosphorus coverage of grain and lath boundaries. Field ion micrographs of grain and lath boundaries have revealed that they are decorated with a semi-continuous film of discrete brightly-imaging precipitates that were identified as molybdenum carbonitride precipitates. In addition, extremely high phosphorus levels were measured at the boundaries. The phosphorus segregation was found to be confined to an extremely narrow region indicative of monolayer-type segregation. The phosphorus coverages determined from the atom probe results of the unirradiated materials were in excellent agreement with predictions

based on McLean's equilibrium model of grain boundary segregation. The boundary phosphorus coverage of a neutron-irradiated weld material was significantly higher than that observed in the unirradiated material.

15820 (CONF-941144–117) **Determination of site-occupancies in aluminide intermetallics by ALCHEMI.** Anderson, I.M. (Oak Ridge National Lab., TN (United States)); Bentley, J.; Duncan, A.J. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009179. Source: OSTI; NTIS; GPO Dep.

The site-distributions of Fe in four B2-ordered NiAl-based alloys with Fe concentrations of 10%, 2%, and 0.5% have been determined by ALCHEMI (atom-location by channeling-enhanced microanalysis). Site-distributions have been extracted with standard errors between ~ 1.5% (10% Fe concentration) and ~ 6% (0.5% Fe concentration). The results show that Fe has no strong site-preference in NiAl and tends to reside on the site of the stoichiometrically deficient host element. An improved ALCHEMI analysis procedure is outlined. The analysis explicitly addresses the phenomenon of ionization delocalization, which previously complicated the determination of site-distributions in aluminide intermetallics, leading to inaccurate and oftentimes nonphysical results. The improved ALCHEMI analysis also addresses the presence of anti-site defects. The data acquisition conditions have been optimized to minimize the sources of statistical and systematic error. This optimized procedure should be suitable for all analyses of B2-ordered alloys. Several analyses at different channeling orientations show that the extracted site-occupancies are robust as long as the data are acquired at orientations that are remote from any major pole of the crystal.

15821 (CONF-941144–118) **Residual stress distribution in FeAl weld overlay on steel.** Wang, X.L.; Spooner, S.; Hubbard, C.R.; Maziasz, P.J.; Goodwin, G.M.; Feng, Z.; Zacharia, T. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009178. Source: OSTI; NTIS; GPO Dep.

Neutron diffraction was used to measure the residual stress distribution in an FeAl weld overlay on steel. It was found that the residual stresses accumulated during welding were essentially removed by the post-weld heat treatment that was applied to the specimen; most residual stresses in the specimen developed during cooling following the post-weld heat treatment. The experimental data were compared with a plasto-elastic finite element analysis. While some disagreement exists in absolute strain values, there is satisfactory agreement in strain spatial distribution between the experimental data and the finite element analysis.

15822 (CONF-941144–125) **Strength, ductility, and fracture mode of ternary FeAl alloys.** Schneibel, J.H.; George, E.P.; Specht, E.D.; Horton, J.A. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95010281. Source: OSTI; NTIS; GPO Dep.

The iron aluminides Fe-45Al-5X-0.2B-0.1Zr (at. %), where X stands for the first row transition metals Ti, V, Cr, Mn, Fe, Co, Ni, Cu, were examined at room temperature for strength, ductility, environmental sensitivity, and fracture mode. The extruded materials were annealed at 1273 K to produce similar grain sizes and then at 673 K to reduce the quenched-in vacancies. All alloys were essentially single phase. Their solid-solution strengthening was found to correlate with the atomic size misfit from the lattice parameters. The "binary" alloy Fe-45Al-O.2B-0.1Zr exhibited predominantly transgranular fracture. Ternary alloying additions with atomic numbers less than that of Fe tended to enhance intergranular fracture, whereas those with atomic numbers higher than that of Fe favored substantial amounts of transgranular fracture. Tensile testing in a partial pressure of dry oxygen increased the ductilities of the ternary alloys only slightly, whereas the ductility of the binary alloy increased from about 8 to about 19%. The ductilities in air correlated inversely with the yield strength. However, those alloys exhibiting substantial amounts of transgranular fracture always showed higher ductilities than those fracturing intergranularly. The fracture results are interpreted in terms of yield strengths and ternary element site occupations.

15823 (CONF-950740–18) **Modeling of stress distributions on the microstructural level in Alloy 600.** Kozaczek, K.J. (Oak Ridge National Lab., TN (United States)); Petrovic, B.G.; Ruud, C.O.; McIlree, A.R. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. From Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995. Order Number DE95009135. Source: OSTI; NTIS; INIS; GPO Dep.

Stress distribution in a random polycrystalline material (Alloy 600) was studied using a topologically correct microstructural model. Distributions of von Mises and hydrostatic stresses at the grain vertices, which could be important in intergranular stress corrosion cracking, were analyzed as functions of microstructure, grain orientations and loading conditions. Grain size, shape, and orientation had a more pronounced effect on stress distribution than loading conditions. At grain vertices the stress concentration factor was higher for hydrostatic stress (1.7) than for von Mises stress (1.5). The stress/strain distribution in the volume (grain interiors) is a normal distribution and does not depend on the location of the studied material volume i.e., surface vs/bulk. The analysis of stress distribution in the volume showed the von Mises stress concentration of 1.75 and stress concentration of 2.2 for the hydrostatic pressure. The observed stress concentration is high enough to cause localized plastic microdeformation, even when the polycrystalline aggregate is in the macroscopic elastic regime. Modeling of stresses and strains in polycrystalline materials can identify the microstructures (grain size distributions, texture) intrinsically susceptible to stress/strain concentrations and justify the correctness of applied stress state during the stress corrosion cracking tests. Also, it supplies the information necessary to formulate the local failure criteria and interpret of nondestructive stress measurements.

15824 (CONF-950740–19) **Modeling of grain boundary stresses in Alloy 600.** Kozaczek, K.J. (Oak Ridge National Lab., TN (United States)); Sinharoy, A.; Ruud, C.O.; McIlree, A.R. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. Contract RP2812-13. From Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995. Order Number DE95009033. Source: OSTI; NTIS; INIS; GPO Dep.

Corrosive environments combined with high stress levels and susceptible microstructures can cause intergranular stress corrosion cracking (IGSCC) of Alloy 600 components on both primary and secondary sides of pressurized water reactors. One factor affecting the IGSCC is intergranular carbide precipitation controlled by heat treatment of Alloy 600. This study is concerned with analysis of elastic stress fields in vicinity of M_7C_3 and $M_{23}C_6$ carbides precipitated in the matrix and at a grain boundary triple point. The local stress concentration which can lead to IGSCC initiation was studied using a two-dimensional finite element model. The intergranular precipitates are more effective stress raisers than the intragranular precipitates. The combination of the elastic property mismatch and the precipitate shape can result in a local stress field substantially different than the macroscopic stress. The maximum local stresses in the vicinity of the intergranular precipitate were almost twice as high as the applied stress.

15825 (DOE/ER–0313/16, pp. 142-145) **Consequences of no postweld heat treatment on the fracture toughness of low activation martensitic steels.** Li, H.; Gelles, D.S.; Jones, R.H. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report*

for the period ending March 31, 1994. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Fracture toughness has been measured for two conditions of low activation martensitic steel F-82H, the first, a fully tempered condition and the second, completely untempered. In the fully tempered condition, F-82H has a J_{IC} toughness of 284 kJ/m^2 (K_{IC} = 263.8 MPa$\sqrt{m}$), but in the untempered condition, the J_{IC} toughness is 18.4 kJ/m^2 (K_{IC} = 64 MPa$\sqrt{m}$). The consequences of not tempering are discussed in light of these measurements.

15826 (DOE/ER–0313/16, pp. 161-169) **Effect of hydrogen on the fracture toughness of a ferritic/martensitic stainless steel.** Li, H.; Jones, R.H.; Hirth, J.P.; Gelles, D.S. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Effects of hydrogen (H) on the mixed-mode I/III critical J integrals (J_{MC}) and tearing moduli (T_M) were examined for a ferritic/martensitic stainless steel (F-82H) at ambient temperature. A determination of J_{MC} was made using modified compact-tension specimens. Different ratios of tension/shear stress were achieved by varying the principal axis of the crack plane between 0 and 55 degrees from the load line. A specimen with 0 degree crack angle is the same as a standard mode I compact tension specimen. Specimens were heat-treated at 1000°C/20 h/air cooled (AC)-1100°C/7 min/AC-700°C/2 h/AC. The specimens were charged with H at a hydrogen gas pressure of 138 MPa at 300°C for two weeks, which resulted in a H content of 6 ppm(wt), as measured with the "inert gas fusion" technique. J_{MC} and T_M values were determined with the single specimen technique. Crack lengths were calculated by means of partial unloading compliances. The preliminary results from J integral tests showed that introducing H decreased J_{MC} and T_M values as compared to those without H. However, the presence of H did not change the dependence of J_{MC} and T_M values on the crack angles. Both mode I J and T values (J_{IC} and T_i) exhibited the highest values. Both the minimum J_{MC} and T_M values occurred at a crack angle between 35 and 55 degrees, corresponding to the load ratio (σ_{III}/σ_I) of 0.7 to 1.4.

15827 (DOE/ER–0313/16, pp. 225-234) **Fabrication of vanadium alloy product forms for specimens preparation.** Grossbeck, M.L. (Oak Ridge National Lab., TN (United States)); Roche, T.K.; Eatherly, W.S.; Dyer, F.F.; Rouse, N.H. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The alloy V-5Cr-5Ti (Teledyne Wah Chang heat 832394) was received in the form of a 6.35 mm plate and was rolled to 3.81 mm plate and 0.76 mm sheet. The 3.81 mm plate was used for Charpy impact specimens and the 0.76 mm sheet was used for tensile specimens and welding experiments. Since interstitial impurities are important strengthening and embrittling agents in refractory metals, all anneals had to be done in ultra-high vacuum furnaces.

15828 (DOE/ER–0313/16, pp. 235-239) **Welding development for V-Cr-Ti alloys.** Goodwin, G.M. (Oak Ridge National Lab., TN (United States)); King, J.F. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Welds have been produced and characterized using the gas-tungsten arc (GTA) and electron beam (EB) welding processes. Thin sheet (0.75 mm) welds were made with three levels of interstitial contamination, and hardness and tensile properties were found to be strongly affected by oxygen pickup. Thick-section (6 mm) welds have been produced using both processes, and no embrittlement is experienced when high purity atmosphere is maintained. Metallographic examination shows a narrow, but coarse grained, heat affected zone for the GTA welds. Transition joint welding development between vanadium alloy and stainless steel has shown encouraging results.

15829 (DOE/ER–0313/16, pp. 244-257) **The relationship between recrystallization temperature, grain size, and the Charpy impact properties of V-Cr-Ti alloys.** Grossbeck, M.L.; Rowcliffe, A.F.; Alexander, D.J. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

It is shown that the blunt notch Charpy impact properties of a V-5Cr-5Ti alloy are extremely sensitive to the grain size distribution developed during the final annealing treatment. Ductile behavior down to liquid nitrogen temperatures can be induced, for example, by a treatment at 950°C, rather than annealing at 1125°C. It is proposed that the resistance to irradiation-induced shift in DBTT reported by Argonne National Laboratory (ANL) researchers for the V-4Cr-4Ti alloy is related primarily to the exceptionally fine-grained microstructure developed during the low temperature processing route adopted for this alloy.

15830 (DOE/ER–0313/16, pp. 258-259) **Room temperature elastic properties of V-5Cr-5Ti.** Simpson, W.A. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Elastic moduli were measured for a specimen of the alloy V-5Cr-5Ti in the annealed condition using pulse-echo techniques. The value of Young's modulus was determined to be 125.6 GPa, the shear modulus was determined to be 45.9 GPa, and the Poisson's ratio to be 0.367.

15831 (DOE/ER–0313/16, pp. 260-268) **Thermophysical properties of V-5Cr-5Ti.** Porter, W.D. (Oak Ridge National Lab., TN (United States)); Dinwiddie, R.B.; Grossbeck, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of thermal expansion of V-5Cr-5Ti have been made from room temperature to 600°C, and specific heat and thermal conductivity have been measured over the range of 100 to 600°C. In each case, the results have been fitted to a polynomial expression to provide a convenient form for design studies.

15832 (DOE/ER–0313/16, pp. 269-271) **Atom probe field ion microscopy characterization of vanadium-titanium-chromium alloys.** Miller, M.K. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The atom probe field ion microscope was used to examine two V-Cr-Ti alloys (V-5Cr-5Ti and V-4Cr-4Ti) which have been shown to have very different fracture properties. The alloys were examined for clustering to detect the presence of small precipitates as well as to determine the distribution of solute elements in the matrix. The elements Ti, Cr, and Si were examined and no clustering of any of these three elements was found.

15833 (DOE/ER–0313/16, pp. 272-278) **Analysis of grain boundaries in a V-5Cr-5Ti alloy using Auger Electron Spectroscopy.** Braski, D.N. (Oak Ridge National Lab., TN (United States)); Grossbeck, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

A V-5Cr-5Ti specimen was fractured in-situ below its DBTT and the fracture surfaces analyzed by Auger Electron Spectroscopy (AES). About 70% of the fresh fracture surfaces were intergranular while the remainder were characteristic of cleavage fracture. Submicron-sized particles appeared to cover most of the grain boundary surfaces along with a few larger particles. Only one of these larger particles, probably a Ti-V sulfide/phosphide combination, contained Cl, at a level of only a few at.%. On the other hand, S, which is known to cause embrittlement in many alloy systems, was detected on virtually all of the grain boundary surfaces.

15834 (DOE/ER–0313/16, pp. 279-292) **Fracture toughness of V-5Cr-5Ti alloy at room temperature and 100°C.** Li, H.;

Jones, R.H.; Hirth, J.P. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The critical mixed-mode I/III fracture toughness, J-integrals (J_{MC}), at room temperature (RT) and 100°C were examined for a V-5Cr-5Ti alloy. Fracture toughness at 100°C was evaluated with a J-integral test and at RT with a K (the stress intensity factor) test. The determination of J_{MC} was made using modified compact-tension specimens. Different ratios of tension/shear stress were achieved by varying the principal axis of the crack plane between 0 and 45 from the load line. Crack angles used in this study were 0, 15, and 45 degrees. A specimen with 0 degree crack angle is the same as a standard mode I compact tension specimen. In this limit, J_{MC} becomes J_{IC}. Specimens were annealed at 1125°C for 1 hour in a vacuum of 10^{-7} torr. J_{MC} and mixed-mode tearing moduli (T_M) were determined at 100°C with the single specimen technique. Crack lengths were calculated with partial unloading compliances. The J_{MC} values at RT were calculated from critical stress intensity factors (K_C). The results showed that at RT the V-5Cr-5Ti alloy was brittle and experienced unstable crack growth with a mixture of intergranular, cleavage and some microvoid coalescence (MVC) fracture while at 100°C it exhibited high fracture toughness and fractured with a mixture of MVC and intergranular failure. SEM investigation showed that some cleavage facets initiated at grain boundaries. The results suggest a low intergranular fracture strength and tendency towards cleavage fracture at room temperature. Preliminary data from Auger electron microscopy showed significant sulfur segregation on grain boundaries. The possible mechanism which might reduce intergranular fracture strength is discussed.

15835 (DOE/ER–0313/16, pp. 342-350) **Room temperature fatigue behavior of OFHC copper and CuAl25 specimens of two sizes.** Singhal, A.; Stubbins, J.F.; Singh, B.N.; Garner, F.A. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830 ; FG06-89ER75522. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Copper and its alloys are appealing for application in fusion reactor systems for high heat flux components where high thermal conductivities are critical, for instance, in divertor components. The thermal and mechanical loading of such components will be, at least in part, cyclic in nature, thus requiring an understanding of their fatigue behavior. This report describes the room temperature fatigue behavior of unirradiated OFHC (oxygen free high conductivity) copper and CuAl25 (copper strengthened with a 0.25% atom fraction dispersion of alumina). The response of two fatigue specimen sizes to strain controlled fatigue loading is examined, and differences in behavior are discussed. Specimens with the smaller size are now being irradiated in several reactors.

15836 (DOE/PC/92542–T9) **Robotic weld overlay coatings for erosion control. Quarterly technical progress report, October 1994–December 1994.** Levin, B.F.; Dupont, J.N.; Marder, A.R. Lehigh Univ., Bethlehem, PA (United States). Energy Research Center. 25 Jan 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92542. Order Number DE95009643. Source: OSTI; NTIS; GPO Dep.

Research is presently being conducted to develop a criteria for selecting weld overlay coatings for erosion mitigation in Circulated Fluidized Beds. Initially, eleven weld overlay alloys were selected for erosion testing based upon a literature review. All eleven coatings were deposited on 1018 steel substrates using the plasma arc welding process. Ten samples from each coating were prepared for erosion testing. The coating deposition and sample preparation procedures were described in the second quarterly report. All selected coatings were erosion tested at 400°C and their erosion resistance was evaluated by determining the steady state erosion rate. In addition, the microstructure of each coating was characterized before and after the erosion tests. The results of the tests are discussed in the third quarterly report. No correlations were found between room temperature hardness of the weld overlay coatings and their erosion resistance at elevated temperature. During the last quarter tensile tests were performed at 400°C for the Ultimet, Inconel-625, 316L SS, C-22, and Stellite-6 wrought alloys. The erosion tests for these materials at 400°C are in progress. The results of mechanical and erosion tests will be used to correlate mechanical properties of selected wrought alloys such as tensile toughness, ductility, strain hardening coefficient and yield strength to their erosion resistance at 400°C. Also, the erosion behavior of the wrought alloys compared with similar weld alloys will be analyzed. The experimental procedure and results of the tensile tests are presented in this progress report.

15837 (EGG-M–94409) **Heat transfer model of runout table cooling: A fundamental approach.** Hernandez, V.H. (Univ. of British Columbia, Vancouver, British Columbia (Canada). Centre for Metallurgical Process Engineering); Samarasekera, I.V.; Brimacombe, J.K. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 35p. Sponsored by USDOE, Washington, DC (United States);American Iron and Steel Inst., Washington, DC (United States);Universidad Nacional Autonoma de Mexico, Mexico City (Mexico);International Council for Canadian Studies, Ottawa, ON (Canada). DOE Contract FC07-93ID13205. (CONF-9410290–4: 36. mechanical working and steel processing conference, Baltimore, MD (United States), Oct 1994). Order Number DE95008603. Source: OSTI; NTIS; GPO Dep.

It is well known that the cooling of hot-rolled steel on the runout table is a determining factor to the final properties of the steel produced. Smaller final ferrite grain size, combined with precipitation strengthening, obtained at high cooling rates, allows lower carbon steels to achieve higher mechanical properties and better weldability and toughness. Here, a semi-theoretical model for jet impingement, and parallel flow boiling curves were developed to compute the strip temperature during cooling on the runout table. Comparison of model predictions with pilot-plant and fullscale measurements is satisfactory. Insight into the fundamental evaporation mechanisms is presented. Variables such as water temperature and flow rate, strip temperature and speed are considered.

15838 (HW–32236) **Quarterly progress report - metallurgy unit - April 1954–June 1954.** Cadwell, J.J. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 16 Jul 1954. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009450. Source: OSTI; NTIS; GPO Dep.

Four irradiated tensile specimens were tested in the Radiometallurgy laboratory. The uranium was from a lot rolled at Simonds Saw and STeel Company, then beta heat treated by the triple dip process. The samples were irradiated to 310 MWD/AT. The corrected exposure was 620 MWD/T after compensating for the decrease in flux depression due to the specimen size. Two of the irradiated specimens were tested in the as-received condition while the other two were vacuum annealed at 400°C for 15 hours prior to testing. When the tensile properties of the unirradiated controls, irradiated, and irradiated-annealed specimens were compared, it was observed that no marked change in modulus of elasticity occurred, the 0.1 percent offset yield strength increased by a factor of about two for the irradiated and irradiated-irradiated, and 35 for the irradiated-annealed specimens, compared to the controls. The marked change in mechanical properties on irradiation as well as the relatively small effect of the anneal, indicates that the foreign atom effect caused by fission product concentration and distribution is the controlling factor, and work-hardening type of damage is relatively insignificant.

15839 (IAE–2152/6) **The applications miniature tensile specimens to determine mechanical properties of irradiated austenitic stainless steel.** Hofman, A. (Institute of Atomic Energy, Otwock-Swierk (Poland)); Kochanski, T.; Malczyk, A. Institute of Atomic Energy, Otwock-Swierk (Poland). Sep 1993. 13p. (In Polish). Order Number DE95628606. Source: OSTI; NTIS; INIS.

The effects of specimen thickness and grain size on the yield strength, ultimate tensile strength and total elongation of austenitic steel OH18N10T have been investigated. Generally the mechanical properties deteriorate with decreasing specimen thickness for a constant grain size. The ratio of specimen thickness (t) to grain size (d) as function of 0.2% yield strength is determined. When the

value of t/d is larger than the critical value, the 0.2% yield strength of miniature specimens become equal to that of the bulk material. (author). 11 refs, 7 figs, 1 tab.

15840 (IAE–2155/6) **Investigation of the properties of aluminium alloys used in the construction of nuclear research reactors.** Hajewska, E. (Institute of Atomic Energy, Otwock-Swierk (Poland)). Institute of Atomic Energy, Otwock-Swierk (Poland). Nov 1993. 48p. Order Number DE95628607. Source: OSTI; NTIS; INIS.

In the paper there are described the results of the studies of the properties of aluminium alloys using in the construction of research reactors, especially of the Polish alloy PAR-1 which belongs to the group of Al-Mg-Si alloys. The influence of the heat treatment on structure of the alloy as well as on the mechanical and corrosion properties was studying. In the paper the results of some properties of PAR-1 alloy after irradiation were done. (author). 27 refs, 43 figs, 9 tabs.

15841 (IEA–2143/6) **The evolution of microstructure of austenitic stainless steels OH18N10T and OOH17N14M2 irradiated with high energy ions.** Hofman, A. (Institute of Atomic Energy, Otwock-Swierk (Poland)); Kochanski, T.; Krasnowski, M. Institute of Atomic Energy, Otwock-Swierk (Poland). Feb 1993. 18p. (In Polish). Order Number DE95628608. Source: OSTI; NTIS; INIS.

The microstructural evolution in austenitic stainless steels irradiated with heavy-ions to a dose of <5 dpa at temperature <100 C has been investigated. The transmission electron microscopy has been used to characterize the microstructural changes and the dependence of density the radiation defects on the dose of irradiation. The data obtained in the experiment were compared with results after neutron irradiation ($E > 0.1$ MeV). (author). 21 refs, 13 figs, 3 tabs.

15842 (INIS-JP–028, pp. 63-65) **Surface functionalization by molten salt electrolytic processes.** Ito, Yasuhiko (Kyoto Univ. (Japan). Faculty of Engineering); Tada, Masayuki; Kawase, Makoto; Goto, Takuya; Asamura, Hiroki. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

The attention has been paid to surface functionalization by molten salt electrolytic processes. Three topics on the experimental results obtained by the authors are described: the electrochemical formation of zirconium metal film and zirconium alloy film on ceramic, surface nitriding of titanium by electrochemical process and an anodic oxide film formation on nickel. (author).

15843 (INIS-JP–028, pp. 88-90) **Basic study on the secondary hydride in zircaloy cladding by the nuclear reaction D(^{3}He,p)^{4}He and thermal desorption.** Hashizumi, Masatsugu (Kyoto Univ. (Japan). Faculty of Engineering); Hattori, Takayuki; Fujita, Haruyuki; Takagi, Ikuji; Higashi, Kunio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Depth profiles of deuterium in zirconium claddings were observed using the nuclear reaction D(^{3}He,p)^{4}He. The deuterium concentrations depended on the cooling rate just after the cladding absorbed deuterium at an elevated temperature. The thermal desorption spectroscopy (TDS) was also conducted. Most deuterium were desorbed at the temperature of 973K. It was found that the deuterium concentrations in the cladding could be known from the TDS measurement. (author).

15844 (INIS-JP–029, pp. 54-56) **Application of plasma driven permeation to the study on deuterium diffusion and trapping in metals.** Tanaka, Toshiyuki (Kyoto Univ. (Japan). Faculty of Engineering); Takagi, Ikuji; Fujita, Haruyuki; Shin, Kazuo; Higashi, Kunio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Deuterium diffusion and permeation in metals were experimentally studied in the plasma driven permeation. The large permeation flux allowed us to determine the diffusion coefficients of deuterium in metals with the time-lag method. The trapping energy in an iron sample was obtained from the apparent diffusion coefficients. The traps were annihilated at elevated temperatures. (author).

15845 (IS-T–1703) **A study of Damascus steel.** Berge, P. Ames Lab., IA (United States). 16 Feb 1995. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010127. Source: OSTI; NTIS; GPO Dep.

The Damascus sword has been an article of fascination for many years to blade collectors and metallurgists alike. The blades were given their name by Europeans who encountered these blades which originated from Damascus, Syria. They are best known for the appearance of the blade face. Genuine Damascus blades show swirling patterns of alternating light and dark regions which are due to the microstructure of the steel. The microstructure consists of arrays of well rounded cementite patterns in a matrix of either pearlite, bainite, or martensite. When this structure is etched the matrix will turn dark leaving the cementite particles light. Although many blades were produced over the centuries, while some of the process is known the making of a genuine Damascus blade today is generally considered a lost art. Many scientists have studied the subject in an attempt to understand the complex process by which the clustered arrays of cementite particles develop in the steel blades. The most prominent theories to date are presented in the General Introduction to this thesis. The thesis is divided into four main parts. In the first part, four proposed mechanisms of cementite cluster sheet formation as they relate to the banding theory are introduced. Experiments to investigate these mechanisms are presented. In Part II, collaborative research focused on the methodology of the reconstructed process for making Damascus steel is presented. In the third part, a study into the graphitization of the reconstructed blades is presented. In Part IV, experimental attempts at producing Damascus steel ingots in the laboratory are presented.

15846 (IS-T–1718) **Dissolution of eutectic microstructures.** Nordlund, C. Ames Lab., IA (United States). 10 Feb 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010244. Source: OSTI; NTIS; GPO Dep.

Literature review of microstructural development during melting revealed comprehensive work on interface stability but only observations of two-phase melting, including eutectic systems, with no analytical work. Four analytical models were developed to establish the role of solute diffusion and surface energy on morphology of a directionally melted lamellar eutectic. First, a mass balance of solute provided solute profile equations for the cases of no diffusion and complete diffusion in the liquid. Second, an energy balance at the interface provided separate equations for the average mp of each phase vs velocity, lamellar spacing, and material constants. Third, the diffusion equation was solved for a planar melting interface (solving for the average temperature of interface and combining with solute profile allowed solution of interface shape). Finally, a balance of the normal solute flux at the interface was used to examine the relation between interface morphology and solute diffusion in the liquid and solid. Experiments were conducted using a transparent organic lamellar eutectic alloy in which the melting interface could be observed in-situ. Steady-state interface morphologies were compared with predictions of solution of diffusion equation. Most experiments fitted the predicted morphologies, with exceptions where diffusive coupling was not maintained and a nonisothermal, nonplanar interface resulted. Experiment also revealed interface instabilities, including brief periods of a single phase planar interface and a Rayleighian instability for the nonplanar morphologies.

15847 (JINR-D–14-94-269(v.1), pp. 7) **High-fequency conductivity of high temperarature superconductors.** Adamyan, V.M. (Odesskij Gosudarstvennyj Univ., Odessa (Ukraine)); Medvedev, M.D. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30.*

Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC. Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. HIGH-TC SUPERCONDUCTORS/electric conductivity; CHARGE CARRIERS; ENERGY GAP; FERMI LEVEL; FREQUENCY DEPENDENCE; SPECIFIC HEAT; TRANSITION TEMPERATURE

15848 (JINR-D–14-94-269(v.1), pp. 16-17) **Superconductivity of helium doped epitaxial films of tin telluride.** Andronik, K.I.; Zasavitskij, E.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. TIN TELLURIDES/superconductivity; CARRIER DENSITY; DOPED MATERIALS; EPITAXY; HELIUM; MAGNETIC FIELDS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; THIN FILMS; SUPERCONDUCTIVITY; TRANSITION TEMPERATURE

15849 (JINR-D–14-94-269(v.1), pp. 31) **Mathematical modeling of radiation damage in HTSC materials.** Barashenkov, V.S. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/physical radiation effects; CRYSTAL DEFECTS; GEV RANGE; IONIZING RADIATIONS; MATHEMATICAL MODELS; MEV RANGE; SIMULATION

15850 (JINR-D–14-94-269(v.1), pp. 75) **Multivalence of critical current of Josephson lattices.** Vysheslavtsev, P.P. (and others); Kurin, V.V.; Levichev, M.Yu. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 4 figs. SUPERCONDUCTING JUNCTIONS/critical current; SUPERCONDUCTING JUNCTIONS/instability; ALUMINIUM OXIDES; CRYSTAL LATTICES; DISTRIBUTION FUNCTIONS; ELECTRIC CONDUCTIVITY; NIOBIUM; INSTABILITY

15851 (JINR-D–14-94-269(v.1), pp. 127-128) **Electron-topological transition in Mo-Re, Mo-Re-Nb systems and its effect on T_k(c) dependence.** Ignat'eva, T.A.; Gann, V.V.; Velikodnyj, A.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. MOLYBDENUM ALLOYS/transition temperature; NIOBIUM ALLOYS/transition temperature; RHENIUM ALLOYS/transition temperature; CONCENTRATION RATIO; CRITICAL CURRENT; ELECTRON-PHONON COUPLING; ENERGY-LEVEL DENSITY; FERMI LEVEL; TERNARY ALLOY SYSTEMS

15852 (JINR-D–14-94-269(v.1), pp. 157-158) **The fishtail in superconductors with coarse inclusions of normal phase.** Kugel', K.I. (AN SSSR, Moscow (Russian Federation). Inst. Vysokikh Temperatur); Rakhmanov, A.L.; Mejlikhov, E.Z.; Matsushita, T. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/critical current; HIGH-TC SUPERCONDUCTORS/magnetic flux; ANALYTICAL SOLUTION; MAGNETIC FIELDS; ORDER PARAMETERS; SIMULATION

15853 (JINR-D–14-94-269(v.1), pp. 163) **Magnetic field penetration into powders from anisotropic superconductor.** Kufaev, Yu.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Sonin, Eh.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HIGH-TC SUPERCONDUCTORS/magnetic fields; HIGH-TC SUPERCONDUCTORS/penetration depth; ANALYTICAL SOLUTION; ANISOTROPY; MAGNETIC SUSCEPTIBILITY; POWDERS

15854 (JINR-D–14-94-269(v.1), pp. 179-180) **Specific features of unidimensional N-S contact properties for superconductors with particle-hole violated symmetry.** Mel'nikov, A.S. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 12 refs. SUPERCONDUCTING JUNCTIONS/critical current; SUPERCONDUCTING JUNCTIONS/interfaces; ELECTRON-HOLE COUPLING; ENERGY GAP; GINZBURG-LANDAU THEORY; HIGH-TC SUPERCONDUCTORS; RELAXATION; INTERFACES

15855 (JINR-D–14-94-269(v.1), pp. 203-204) **Nonequilibrium phenomena is superconducting two-barrier Nb/Nb'/Nb.** Ovsyannikov, G.A. (Moskovskij Inst. Radiotekhniki, Ehlektroniki i Avtomatiki, Moscow (Russian Federation)); Komissinskij, F.V.; Filippenko, L.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs., 1 fig. ALUMINIUM OXIDES/superconducting junctions; NIOBIUM/superconducting junctions; SUPERCONDUCTING JUNCTIONS/transition temperature; ELECTRIC CONDUCTIVITY; ELECTRON-ELECTRON INTERACTIONS; INTERFACES; LAYERS; NIOBIUM

15856 (JINR-D–14-94-269(v.1), pp. 216-217) **Magnetic penetration depth in $BaPb_{1-x}Bi_xO_3$ measured by μSR.** Pomyakushin, V.Yu. (and others); Duginov, V.N.; Grebinnik, V.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs., 1 fig. SUPERCONDUCTORS/penetration depth; SUPERCONDUCTORS/transition temperature; BARIUM OXIDES; BISMUTH OXIDES; CERAMICS; LEAD OXIDES; MAGNETIC FIELDS; MUON SPIN RELAXATION; SUPERCONDUCTIVITY; SUPERCONDUCTORS; TEMPERATURE RANGE 0000-0013 K

15857 (JINR-D–14-94-269(v.1), pp. 219) **On the existence of metallic and the Mott's type activation conductivity in metallic glasses.** Pomortsev, R.V. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. METALLIC GLASSES/crystal defects; METALLIC GLASSES/electric conductivity; ELECTRONIC STRUCTURE; EQUATIONS OF STATE; MOTT SCATTERING; RELAXATION; TEMPERATURE DEPENDENCE

15858 (JINR-D–14-94-269(v.1), pp. 222-223) **Current noise and specific features of current states in rigid superconductors.** Rol'shchikov, A.B. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Prekul, A.F.; Shchegolikhina, N.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig., 2 refs. TITANIUM BASE ALLOYS/critical current; BINARY ALLOY SYSTEMS; CRYSTAL-PHASE TRANSFORMATIONS; MAGNETIC FLUX; NOISE; SUPERCONDUCTORS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; VANADIUM ALLOYS

15859 (JINR-D–14-94-269(v.1), pp. 234) **Calculation of mechano-thermal effect in superconductors.** Sazonov, S.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TYPE-II SUPERCONDUCTORS/penetration depth; ALUMINIUM; ANALYTICAL SOLUTION; CADMIUM; MAGNETIC FIELDS; TRANSITION TEMPERATURE; TUBES

15860 (JINR-D–14-94-269(v.1), pp. 241) **Surface impedance of type-II superconductor in a mixed state and the Bin-Livingston barrier.** Sonin, Eh.B. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Trajko, K.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. TYPE-II SUPERCONDUCTORS/electric impedance; DIAMAGNETISM; ELECTRODYNAMICS; MAGNETIC FIELDS; MAGNETIC FLUX; MAGNETIC SUSCEPTIBILITY; MAGNETORESISTANCE; ORIENTATION; SURFACES

15861 (JINR-D–14-94-269(v.1), pp. 244-245) **Influence of twins and dislocations on critical current and pinning force in single crystal niobium.** Starodubov, Ya.D. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Sokolenko, V.I.; Borisova, I.F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs., 3 figs. NIOBIUM/critical current; NIOBIUM/magnetic flux; COLD WORKING; DISLOCATIONS; ELECTRIC CONDUCTIVITY; MONOCRYSTALS; NIOBIUM; SUPERCONDUCTORS; TWINNING

15862 (JINR-D–14-94-269(v.1), pp. 250-252) **Influence of head treatment conditions on pinning force in Nb-22Ta-37Ti superconductor.** Storozhilov, G.E. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Chernyj, O.V.; Udov, L.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 4 figs. NIOBIUM ALLOYS/critical current; NIOBIUM ALLOYS/superconductors; TANTALUM ALLOYS/critical current; TANTALUM ALLOYS/superconductors; TITANIUM ALLOYS/critical current; TITANIUM ALLOYS/superconductors; HEAT TREATMENTS; MAGNETIC FLUX; MATERIALS WORKING; SUPERCONDUCTORS; TERNARY ALLOY SYSTEMS

15863 (JINR-D–14-94-269(v.1), pp. 263-264) **Localization effects and superconductivity in two-dimensional beryllium films.** Tutov, V.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Semenenko, E.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. BERYLLIUM/superconducting films; BERYLLIUM/superconductivity; ANNEALING; BERYLLIUM; SUPERCONDUCTIVITY; MAGNETIC FIELDS; MAGNETORESISTANCE; THIN FILMS

15864 (JINR-D–14-94-269(v.2), pp. 70) **Magnetoelastic anomalies and Moessbauer spectrum-peculiarities of holmium monocrystals in the range of magnetic phase transformations.** Bodryakov, V.Yu. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Godovikov, S.K.; Nikitin, S.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HOLMIUM/young modulus; HOLMIUM; INTERNAL FRICTION; LATTICE PARAMETERS; MAGNETIC FIELDS; MOESSBAUER EFFECT; MONOCRYSTALS; PHASE TRANSFORMATIONS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; TEMPERATURE RANGE 0400-1000 K

15865 (JINR-D–14-94-269(v.2), pp. 71) **Anomalous behaviour of europium Yong modulus and internal friction in the region of phase-transformation PM-HAFM.** Bodryakov, V.Yu. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Nikitin, S.A. Rossijskaya Akademiya Nauk, Moscow (Russian

Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. EUROPIUM/internal friction; EUROPIUM/young modulus; CRYSTAL LATTICES; EUROPIUM; LATTICE PARAMETERS; MAGNETIC FIELDS; PHASE TRANSFORMATIONS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; TEMPERATURE RANGE 0400-1000 K

15866 (JINR-D–14-94-269(v.2), pp. 72-73) **Erbium and thulium antiferromagnetism - features of long-range and short-range order.** Boyarskij, L.A. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. ERBIUM/antiferromagnetism; ERBIUM/phase transformations; THULIUM/antiferromagnetism; THULIUM/phase transformations; ERBIUM; ANTIFERROMAGNETISM; MAGNETIC MOMENTS; ORDER PARAMETERS; THULIUM

15867 (JINR-D–14-94-269(v.2), pp. 75-76) **Magnetoheterogeneous state of structural phase transformations over magnetic field in holmium monocrystal.** Bulatov, A.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Dolzhenko, V.F.; Korniets, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HOLMIUM/crystal-phase transformations; HOLMIUM/thermodynamic properties; CURIE POINT; HOLMIUM; LATTICE PARAMETERS; MAGNETIC FIELDS; MAGNETIZATION; MONOCRYSTALS; PHASE DIAGRAMS; PHASE STUDIES; TEMPERATURE DEPENDENCE; X-RAY DIFFRACTION

15868 (JINR-D–14-94-269(v.2), pp. 120-121) **Kinetics of plastic deformation of Ti-O solid solutions at temperatures 1 K ad below.** Kovaleva, V.N. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Moskalenko, V.A.; Natsik, V.D.; Shumilin, S.Eh. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. TITANIUM BASE ALLOYS/ductility; TITANIUM BASE ALLOYS/strains; CONCENTRATION RATIO; DISLOCATIONS; HCP LATTICES; KINETICS; OXYGEN ADDITIONS; SOLID SOLUTIONS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TENSILE PROPERTIES; DUCTILITY; STRAINS; YIELD STRENGTH

15869 (JINR-D–14-94-269(v.2), pp. 123) **Accurate solution of nonlinear discrete model of surface reconstruction and localized structural phase transformations.** Kosevich, Yu.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. METALS/phase transformations; ANALYTICAL SOLUTION; CRYSTAL LATTICES; DOMAIN STRUCTURE; METALS; SEMICONDUCTOR MATERIALS; SURFACE PROPERTIES; THIN FILMS

15870 (JINR-D–14-94-269(v.2), pp. 127-128) **Electric and magnetic properties of semiconductors $Hg_{1-x}Mn_xTe_{1-y}Se_y$ at low temperatures.** Kubal'chinskij, V.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Mar'yanchuk, P.D.; Churilov, I.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 3 figs., 1 tab. TELLURIUM ALLOYS/electric conductivity; TELLURIUM ALLOYS/magnetic susceptibility; HALL EFFECT; MAGNETIC FIELDS; MAGNETIC SEMICONDUCTORS; MANGANESE ALLOYS; MERCURY ALLOYS; SELENIUM ALLOYS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K

15871 (JINR-D–14-94-269(v.2), pp. 131-132) **Ultrahigh ferromagnetic properties of hydroextruded dysprosium.** Lazarev, B.G. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Lazareva, L.S.; Chernyak, N.A.; Chupikov, A.A.; Kutsenko, P.A.; Pryadkin, B.K.; Spuskanyuk, V.Z.; Kovalenko, I.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 8 refs., 1 fig. DYSPROSIUM/magnetization; DYSPROSIUM; MAGNETIZATION; ELECTRIC CONDUCTIVITY; EXTRUSION; MAGNETIC FIELDS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

15872 (JINR-D–14-94-269(v.2), pp. 147-148) **Effect of nearest surrounding on the formation of intervalent state in Ce-Ni compounds.** Nefedova, E.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Alekseev, P.A.; Klement'ev, E.S.; Lazukov, V.N.; Sadikov, I.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. CERIUM ALLOYS/valence; LANTHANUM ALLOYS/valence; NICKEL ALLOYS/valence; PRASEODYMIUM ALLOYS/valence; YTTRIUM ALLOYS/valence; VALENCE; CRYSTAL LATTICES; ELECTRONS; LATTICE PARAMETERS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K;

TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; THERMAL EXPANSION

15873 (JINR-D–14-94-269(v.2), pp. 149-150) **Logarithmic relaxation of electric conductivity and phase transitions in now cluster chalcohenides $Re_{4-x}Mo_xS_4Te_4$.** Romanenko, A.I. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Mironov, Yu.V.; Fedorov, V.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 5 figs. MOLYBDENUM ALLOYS/electric conductivity; MOLYBDENUM ALLOYS/phase transformations; RHENIUM ALLOYS/electric conductivity; RHENIUM ALLOYS/phase transformations; TELLURIDES/electric conductivity; TELLURIDES/phase transformations; SULFIDES; TELLURIDES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

15874 (JINR-D–14-94-269(v.2), pp. 159-160) **Fluctuation damping of magnons in ferromagnetic metals.** Solontsov, A.Z. (Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Neorganicheskikh Materialov, Moscow (Russian Federation)); Vasil'ev, A.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. IRON BASE ALLOYS/magnons; NICKEL ALLOYS/magnons; DAMPING; FERROMAGNETIC MATERIALS; FLUCTUATIONS; MAGNONS; SPIN WAVES

15875 (JINR-D–14-94-269(v.2), pp. 197-198) **Ultrasound reflection in neighborhood of superlattice resonances.** Bebenin, N.G. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. METALS/ultrasonic waves; DIELECTRIC MATERIALS; ELECTROMAGNETIC RADIATION; HELICON RESONANCE; MAGNETIC FIELDS; METALS; NUMERICAL SOLUTION; SUPERLATTICES; TEMPERATURE RANGE 0065-0273 K

15876 (JINR-D–14-94-269(v.2), pp. 203) **Quantum corrections to the conductivity of charge carriers 2D-system with anisotropy spectrum in hydrostatic compression conditions (holes on tellurium (0001) surface).** Berezovets, V.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Smirnov, A.O.; Farbshtejn, I.I.; Shubnikov, M.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. TELLURIUM/magnetoresistance; CHARGE CARRIERS; COMPRESSION; MAGNETIC FIELDS; PRESSURE DEPENDENCE; SURFACE PROPERTIES; TELLURIUM; MAGNETORESISTANCE; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K

15877 (JINR-D–14-94-269(v.2), pp. 220-221) **Effect of electron-phonon interaction on the conductivity of Nb thin films.** Gershenzon, E.M. (Moskovskij Gosudarstvennyj Pedagogicheskij Inst., Moscow (Russian Federation)); Ptitsina, N.G.; Sergeev, A.V.; Chulkova, G.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs., 3 figs. NIOBIUM/electric conductivity; NIOBIUM/electron-phonon coupling; KINETICS; NIOBIUM; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0273-0400 K; THIN FILMS

15878 (JINR-D–14-94-269(v.2), pp. 226) **Giant geometric oscillations of ultrasound absorption.** Gudkov, V.V. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Tkach, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. INDIUM/oscillations; INDIUM; OSCILLATIONS; MAGNETIC FIELDS; MONOCRYSTALS; TEMPERATURE RANGE 0000-0013 K; ULTRASONIC TESTING

15879 (JINR-D–14-94-269(v.2), pp. 232-233) **The role of boundary conditions in peculiar properties of two-dimensional electron gas. (Quantum Hall effect).** Egorov, V.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. METALS/electron gas; METALS/hall effect; CURRENTS; DOMAIN STRUCTURE; ELECTRON DENSITY; FERMI LEVEL; MAGNETIC FIELDS; MAGNETIZATION; METALS; OSCILLATIONS

15880 (JINR-D–14-94-269(v.2), pp. 252-253) **Determination of conditions of Kondo-insulator CeNiSn base state formation.** Klement'ev, E.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Alekseev, P.A.; Lazukov, V.N.; Sadikov, I.P.; Muzychka, A.Yu.; Sashin, I.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. CERIUM ALLOYS/f states; LANTHANUM ALLOYS/f states; NEODYMIUM ALLOYS/f states; CRYSTAL LATTICES; ELECTRIC FIELDS; NEUTRON LEAKAGE; NICKEL ALLOYS; SPECTRA; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TIN ALLOYS

15881 (JINR-D–14-94-269(v.2), pp. 261-262) **Quasiclassic kinetic theory of giant magnetoresistance effect in metal magnetic superlattices.** Kravtsov, E.V. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Okulov, V.I.; Ustinov, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. METALS/magnetoresistance; ELECTRON DIFFRACTION; FERMI LEVEL; FERROMAGNETIC MATERIALS; LAYERS; MAGNETIC FIELDS; MAGNETIZATION; METALS; MAGNETORESISTANCE; SPIN; SUPERLATTICES

15882 (JINR-D–14-94-269(v.2), pp. 273-274) **Transformation of excitation spectra of 4f electrons in $Ce_{1-x}La_xNi$ compounds.** Lazukov, V.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Alekseev, P.A.; Klement'ev, E.S.; Sadikov, I.P.; Goremychkin, E.A.; Osborn, R. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. CERIUM ALLOYS/electron spectra; CERIUM ALLOYS/f states; LANTHANUM ALLOYS/electron spectra; LANTHANUM ALLOYS/f states; NICKEL ALLOYS/electron spectra; NICKEL ALLOYS/f states; MAGNETIC PROPERTIES

15883 (JINR-D–14-94-269(v.2), pp. 285) **Nonlinear electromagnetic waves in laminated conductors in quantizing magnetic field.** Peschanskij, V.G. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Stepanenko, D.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TRANSITION ELEMENT COMPOUNDS/electromagnetic radiation; ANISOTROPY; CHALCOGENIDES; ELECTRIC CONDUCTIVITY; ELECTRON SPECTRA; ENERGY SPECTRA; FERMI LEVEL; LAYERS; MAGNETIC FIELDS; MAGNETIC SUSCEPTIBILITY

15884 (JINR-D–14-94-269(v.2), pp. 289) **Development of electromagnetic wave instability under current impulse on the metal action.** Rinkevich, A.B. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Ustinov, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. METALS/electromagnetic radiation; CHARGE CARRIERS; CURRENTS; MAGNETIC FIELDS; METALS; PULSES; TEMPERATURE RANGE 0065-0273 K

15885 (LA-UR–95-619) **Ductile damage model with void coalescence.** Tonks, D.L. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9507100–2: Plasticity and its current applications symposium, Osaka (Japan), 17-21 Jul 1995). Order Number DE95007855. Source: OSTI; NTIS; GPO Dep.

A general model for ductile damage in metals is presented. It includes damage induced by shear stress as well as damage caused by volumetric tension. Spallation is included as a special case. Strain induced damage is also treated. Void nucleation and growth are included and give rise to strain rate effects. Strain rate effects also arise in the model through elastic release wave propagation between damage centers. Underlying physics of the model is the nucleation, growth, and coalescence of voids in a plastically flowing solid. Implementation of the model in hydrocodes is discussed.

15886 (LA-UR–95-626) **Numerical analysis of the ultraprecision machining of copper.** Stevens, R. (Los Alamos National Lab., NM (United States)); Anderson, C.; Rhorer, R.; Lucca, D. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505203–1: 8. annual IPES meeting, Compiegne (France), 6-12 May 1995). Order Number DE95007857. Source: OSTI; NTIS; GPO Dep.

Modeling of the ultraprecision machining process can aid in the understanding of the relative importance of various process parameters and ultimately lead to improved methods of generating ultraprecision surfaces such as those required for metal optics and single crystal microelectronics substrates. Any modeling method should be verified by direct comparison to experimental data. Until recently it has been difficult to accurately measure the cutting edge, or sharpness, of a diamond tool; and therefore, most models have assumed an infinitely sharp cutting tip. With the relatively new technology of the Atomic Force Microscope (AFM), the cutting edge of single crystal diamond tools can be quantitatively described. Ultraprecision machining experiments using an AFM characterized cutting tool and orthogonal geometry have been performed. These experiments have resulted in measured cutting and thrust forces for different depths of cut in copper (Te-Cu: 99.4-99.5% Cu, 0.5-0.6% Te, 4-5 micron grain size, 225 MPa yield strength) with a well characterized diamond tool. By using this actual tool tip geometry the authors have been able to develop a model that can predict cutting and thrust forces for depths of cut on the order of the sharpness of the tool. Forces predicted by this numerical model are compared to the experimentally measured forces.

15887 (LA-UR–95-784) **Numerical implementation of a state variable model for friction.** Korzekwa, D.A. (Los Alamos National Lab., NM (United States)); Boyce, D.E. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9506144–1: 5. international conference on numerical methods in industrial forming processes (NUMIFORM), Ithaca, NY (United States), 18-21 Jun 1995). Order Number DE95007844. Source: OSTI; NTIS; GPO Dep.

A general state variable model for friction has been incorporated into a finite element code for viscoplasticity. A contact area evolution model is used in a finite element model of a sheet forming friction test. The results show that a state variable model can be used to capture complex friction behavior in metal forming simulations. It is proposed that simulations can play an important role in the analysis of friction experiments and the development of friction models.

15888 (LA-UR–95-918) **Influence of strain rate and temperature on the mechanical behavior of iron aluminide-based alloys.** Gray, G.T. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9507100–1: Plasticity and its current applications symposium, Osaka (Japan), 17-21 Jul 1995). Order Number DE95009426. Source: OSTI; NTIS; GPO Dep.

Iron aluminides are receiving increasing attention as potential high temperature structural materials due to their excellent oxidation and sulfidation resistance. Although the influence of strain rate on the microstructure/property relationships of pure iron and a variety of iron alloys and steels has been extensively studied, the effect of strain rate on the stress-strain and deformation response

of iron aluminides remains poorly understood. In this paper the influence of strain rate, varied between 0.001 and 10^4 s^{-1}, and temperature, between 77 & 1073°K, on the mechanical behavior of Fe-40Al-0.1B and Fe-16.12Al-5.44Cr-0.11Zr-0.13C-1.07Mo-006Y, called FAP-Y, (both in at.%) is presented. The rate sensitivity and work hardening of Fe-40Al and the disordered alloy based on Fe-16% Al are discussed as a function of strain rate and temperature.

15889 (LA-UR–95-1130) **Open architecture CNC system.** Tal, J. (Galil Motion Control Inc., Sunnyvale, CA (United States)); Lopez, A.; Edwards, J.M. Los Alamos National Lab., NM (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9506169–1: 24. annual symposium on incremental motion control systems and devices, San Jose, CA (United States), 7 Jun 1995). Order Number DE95009485. Source: OSTI; NTIS; GPO Dep.

In this paper, an alternative solution to the traditional CNC machine tool controller has been introduced. Software and hardware modules have been described and their incorporation in a CNC control system has been outlined. This type of CNC machine tool controller demonstrates that technology is accessible and can be readily implemented into an open architecture machine tool controller. Benefit to the user is greater controller flexibility, while being economically achievable. PC based, motion as well as non-motion features will provide flexibility through a Windows environment. Upgrading this type of controller system through software revisions will keep the machine tool in a competitive state with minimal effort. Software and hardware modules are mass produced permitting competitive procurement and incorporation. Open architecture CNC systems provide diagnostics thus enhancing maintainability, and machine tool up-time. A major concern of traditional CNC systems has been operator training time. Training time can be greatly minimized by making use of Windows environment features.

15890 (PNL-SA–25506) **Irradiation-assisted stress corrosion cracking considerations at temperatures below 288°C.** Simonen, E.P.; Jones, R.H.; Bruemmer, S.M. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950304–14: Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show, Orlando, FL (United States), 26-31 Mar 1995). Order Number DE95008940. Source: OSTI; NTIS; INIS; GPO Dep.

Irradiation-assisted stress corrosion cracking (IASCC) occurs above a critical neutron fluence in light-water reactor (LWR) water environments at 288 C, but very little information exists to indicate susceptibility as temperatures are reduced. Potential low-temperature behavior is assessed based on the temperature dependencies of intergranular (IG) SCC in the absence of irradiation, radiation-induced segregation (RIS) at grain boundaries and micromechanical deformation mechanisms. IGSCC of sensitized SS in the absence of irradiation exhibits high growth rates at temperatures down to 200 C under conditions of anodic dissolution control, while analysis of hydrogen-induced cracking suggests a peak crack growth rate near 100 C. Hence from environmental considerations, IASCC susceptibility appears to remain likely as water temperatures are decreased. Irradiation experiments and model predictions indicate that RIS also persists to low temperatures. Chromium depletion may be significant at temperatures below 100C for irradiation doses greater than 10 displacements per atom (dpa). Macromechanical effects of irradiation on strength and ductility are not strongly dependent on temperature below 288 C. However, temperature does significantly affect radiation effects on SS microstructure and micromechanical deformation mechanisms. The critical conditions for material susceptibility to IASCC at low temperatures may be controlled by radiation-induced grain boundary microchemistry, strain localization due to irradiation microstructure and irradiation creep processes. 39 refs.

15891 (PNL-SA–26013) **Interfacial segregation and deformation of superplastically deformed Al-Mg-Mn alloys.** Vetrano, J.S.; Lavender, C.A.; Bruemmer, S.M. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950201–13: Annual meeting and exhibition of the Minerals, Metals and Materials Society (TMS), Las Vegas, NV (United States), 12-16 Feb 1995). Order Number DE95009572. Source: OSTI; NTIS; GPO Dep.

Microstructural and microchemical studies have been carried out on superplastically deformed Al-Mg-Mn (AA5083-type) alloys. Grain boundary composition was measured using a Scanning Auger Microprobe (SAM) and an Analytical Transmission Electron Microscope (ATEM), while conventional TEM was used for microstructural evaluation. Non-equilibrium segregation of Si to grain boundaries following deformation was measured by both techniques. Significant interfacial Si enrichment was only detected in gage sections of tensile specimens after uniaxial strains from 50 to 200%. Grip regions which experience identical thermal histories, but without plastic deformation, did not reveal Si segregation. Selected samples also showed a slight depletion of Mg at grain boundaries after deformation. The only reproducible observation of equilibrium segregation was in Zr-modified alloys, where Sn was detected by SAM in both the deformed and undeformed sections of the sample. Microstructural analysis documented subgrain formation and subgrain-precipitate interactions during superplastic deformation. In addition, many grain boundaries and precipitate interfaces contained small (5 to 20 nm) voids. Compositional analysis of these nano-voids revealed that they were enriched in Mg with the adjacent boundary regions correspondingly depleted.

15892 (SAND–95-0284C) **The role of dynamic experimentation for computation analysis.** Chhabildas, L.C.; Trucano, T.G. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950788–3: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95007733. Source: OSTI; NTIS; GPO Dep.

In this paper a brief description of dynamic techniques commonly available for determining material property studies is presented. For many impact applications, the material generally experiences a complex loading path. In most cases, the initial loading conditions can be represented by the shock commonly referred to as the Hugoniot state. Subsequent loading or release structure, i.e., off-Hugoniot states would however be dependent on the physical processes dominating the material behavior. The credibility of the material model is tested by the accuracy of predictions of off-Hugoniot states. Experimental techniques commonly used to determine off-Hugoniot states are discussed in this survey.

15893 (SAND–95-0380C) **Development of a precision wire feeder for small-diameter wire.** Brandon, E.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503113–1: Automotive laser applications workshop, Dearborn, MI (United States), 6-7 Mar 1995). Order Number DE95008541. Source: OSTI; NTIS; GPO Dep.

At Sandia National Laboratories in Albuquerque, the author designed and fabricated a precision wire feeder to be used with high energy density (electron beam and laser beam) welding for weld joints where filler wire might be needed to fill a gap or to adjust the chemical composition so that a crack-free weld could be made. The wire feeder incorporates a 25,000 step-per-revolution motor to power a urethane-coated drive roll. A microprocessor-based controller provides precise control of the motor and allows both continuous and pulsed feeding of the wire. A unidirectional 0.75-in.-dia ball bearing is used to press the wire against the drive roll. A slight constant backward tension is maintained on the wire spool by a Bodine torque motor. A Teflon tube is used to guide the wire from the drive roll to the vicinity of the weld, where a hypodermic needle is used to aim the wire into the weld pool. The operation of the wire feeder was demonstrated by feeding a 10-mil-dia, Type 304 stainless steel wire into a variety of CO_2 laser beam welds. The resulting welds are smooth and continuous, and the welds are considered to be completely satisfactory for a variety of applications.

15894 (SKB-TR–94-12) **Research on corrosion aspects of the advanced cold process canister.** Blackwood, D.J. (AEA Technology, Harwell Laboratory, Didcot, Oxfordshire (United Kingdom)); Hoch, A.R.; Naish, C.C.; Rance, A. Swedish Nuclear Fuel

and Waste Management Co., Stockholm (Sweden). Jan 1994. 84p. Order Number DE95626416. Source: OSTI; NTIS; INIS.

The Advanced Cold Process Canister (ACPC) is a waste canister being developed jointly by SKB and TVO for the disposal of spent nuclear fuel. It comprises an outer copper canister, with a carbon steel canister inside. A concern regarding the use of the ACPC is that, in the unlikely event that the outer copper canister is penetrated, the anaerobic corrosion of the carbon steel container may result in the formation of hydrogen gas bubbles. These bubbles could disrupt the backfill, and thus increase water flow through the near field and the flux of radionuclides to the host geology. A number of factors that influence the rate at which hydrogen evolves as a result of the anaerobic corrosion of carbon steel in artificial granitic groundwaters have been investigated. A previously observed, time-dependent decline in the hydrogen evolution rate has been confirmed as being due to the production of magnetite film. Once the magnetite film is about 0.7-1.0 μm thick, the rate of hydrogen evolution reaches a steady state value. The pH and the ionic strength of the groundwater were both found to influence the long-term hydrogen evolution rate. The results of the experimental programme were used to update a model of the corrosion behaviour and hydrogen production from the Advanced Cold Process Canister. 36 figs, 5 tabs, 13 refs.

15895 (SKB-TR–94-13) **Assessment study of the stresses induced by corrosion in the Advanced Cold Process Canister.** Hoch, A.R. (Chemical Studies Department, Radwaste Disposal Division, AEA Decommissioning and Radwaste, Harwell Laboratory, Oxfordshire (United Kingdom)); Sharland, S.M. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Oct 1993. 28p. Order Number DE95626417. Source: OSTI; NTIS; INIS.

The Advanced Cold Process Canister (ACPC) is a concept for the encapsulation of spent nuclear fuel for geological disposal. The basic design of the ACPC consists of an outer oxygen free copper overpack covering a carbon steel inner container. In this report the stresses exerted on the copper overpack as a result of an early failure of the canister and the subsequent corrosion of the steel are calculated. 4 figs, 8 refs, 2 tabs.

15896 (STUDSVIK-M–94-117) **Coolant compatibility studies. The effect of irradiation on stress corrosion cracking sensitivity of a martensitic steel type 1.4914 MANET 4-complementary studies. Part 2.** Nystrand, A.C. Studsvik Material AB, Nykoeping (Sweden). 1994. 16p. Order Number DE95626429. Source: OSTI; NTIS; INIS.

Prior stress corrosion cracking tests of a high-chromium martensitic steel of type 1.4914, referred to as MANET, did not show any irradiation assisted stress corrosion cracking (IASCC). Three-point bend specimens stressed to 95% of the yield strength were used. They were manufactured from coupons previously exposed in a high pressure water loop in the Studsvik R2 reactor. Complementary stress corrosion testing of two irradiated notched three-point bend specimens has been performed. Higher stresses compared to previous experiments were used. However, the specimens have not revealed any signs of IASCC. 5 refs, 4 figs, 4 tabs.

15897 (SVF–529) **Investigation of mechanical properties in a rotor blank of an improved 10% chromium steel manufactured through the PM/HIP process.** Faellman, S. (ABB Stal, Finspaang (Sweden)); Kastensson, P. Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 27p. Project Vaermeforsk-M1-104. Order Number DE95766637. Source: OSTI; NTIS.

A simulated rotor blank of an improved 10% Cr steel with dimension 500 x 700 mm, corresponding to normal rotor diameter of VAX HP turbines, has been manufactured through the PM/HIP process. The aim of the project was to investigate mechanical properties of a rotor with the same dimension as a typical forged HP rotor, determine the homogeneity of the rotor and compare the mechanical properties with conventional 12% Cr steel and previously tested HIP'ed 10% Cr steel. Mechanical properties as tensile, impact, fatigue, fracture toughness, creep and ageing response have been investigated in different locations and directions of the rotor. The results show only small variations in different parts of the rotor indicating a homogeneous material. Tensile, toughness and fatigue properties are all in accordance with previously tested PM/HIP and forged 10% Cr steel and creep properties are improved compared to conventional 12% Cr steel. A slight tendency of notch sensitivity can though be seen in the HIP'ed rotor and also a more pronounced ageing response compared to conventional 12% Cr steel.

15898 (UCRL-JC–119681) **Creep of a fine-grained, fully-lamellar, two-phase TiAl alloy at 760°C.** Wang, J.N. (Lawrence Livermore National Lab., CA (United States)); Schwartz, A.J.; Nieh, T.G.; Liu, C.T.; Sikka, V.K.; Clemens, D. Lawrence Livermore National Lab., CA (United States); Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC05-84OR21400. (CONF-950201–11: Annual meeting and exhibition of the Minerals, Metals and Materials Society (TMS), Las Vegas, NV (United States), 12-16 Feb 1995). Order Number DE95009531. Source: OSTI; NTIS; GPO Dep.

Creep of a TiAl alloy, having a composition of Ti-47Al-2Cr-2Nb (in atom %) and a fine-grained, fully-lamellar structure, was carried out at 760 C and stresses between 69–723 MPa. It was found that, in addition to having good room temperature properties, the alloy exhibits higher creep resistance than other TiAl alloys with a similar composition. Both the creep data and microstructures of the alloy suggest that there exists a change in deformation mechanism from a glide-controlled process at high stresses to a recovery-controlled process at low stresses. Also, microstructural evidence indicates that the rate-controlling recovery mechanism is the climb of dislocation segments pinned by ledges at γ/α_2 interfacial boundaries.

15899 (UCRL-JC–119682) **Synthesis and characterization of nanophase face-centered-cubic titanium.** Jankowski, A.F.; Wall, M.A. Lawrence Livermore National Lab., CA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950201–10: Annual meeting and exhibition of the Minerals, Metals and Materials Society (TMS), Las Vegas, NV (United States), 12-16 Feb 1995). Order Number DE95009533. Source: OSTI; NTIS; GPO Dep.

Unalloyed Ti is sputter deposited in the formation of two trilayer films. Each layer within the combinations of Ni-Ti-Ni and Ti-Ni-Ti is less than 0.1 μm thick. High resolution imaging and electron diffraction results are presented for the microstructural characterization of both trilayer films. Nanophase fcc Ti is initially found in crystalline layers grown on Ni whereas hcp Ti is found in layers grown without a Ni epilayer. Conditions are further examined under which the fcc to hcp transition occurs for Ti deposited on Ni.

15900 (VTT-TIED–1550) **Joining dissimilar stainless steels for pressure vessel components.** Zheng Sun (VTT Manufacturing Technology, Espoo (Finland). Production Engineering); Huai-Yue Han. Technical Research Centre of Finland, Espoo (Finland). 1994. 30p. Order Number DE95628594. Source: OSTI; NTIS; INIS.

A series of studies was carried out to examine the weldability and properties of dissimilar steel joints between martensitic and austenitic stainless steels - F6NM (OCrl3Ni4Mo) and AISI 347, respectively. The weldability tests included weld thermal simulation of the martensitic steel for investigating the influence of weld thermal cycles and post-weld heat treatment (PWHT) on the mechanical properties of the heat-affected zone (HAZ); implant testing for examining the tendency for cold cracking of martensitic steel; rigid restraint testing for determining hot crack susceptibility of the multi-pass dissimilar steel joints. The joints were subjected to various mechanical tests including a tensile test, bending test and impact test at various temperatures, as well as slow strain-rate test for examining the stress corrosion cracking tendency in the simulated environment of a primary circuit of a PWR. Based on the weldability tests, a welding procedure - tungsten inert gas (TIG) welding for root passes with HNiCrMo-2B wire followed by manual metal arc (MMA) welding using coated electrode ENiCrFe-3B - was developed and a PWHT at 600 deg C/2h was recommended. Furthermore, the welding of tube/tube joints between these dissimilar steels is described. (21 refs., 11 figs., 14 tabs.).

15901 (WSRC-MS–94-0463) **Analytical modeling of the effect of crack depth, specimen size, and biaxial stress on the fracture toughness of reactor vessel steels.** Chao, Yuh-Jin (Univ. of South Carolina, Columbia, SC (United States). Dept. of

Mechanical Engineering); Lam, Poh-Sang. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950740–5: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95005886. Source: OSTI; NTIS; INIS; GPO Dep.

Fracture, toughness values for A533-B reactor pressure vessel (RPV) steel obtained from test programs at Oak Ridge National Laboratory (ORNL) and University of Kansas (KU) are interpreted using the J-A_2 analytical model. The analytical model is based on the critical stress concept and takes into consideration the constraint effect using the second parameter A_2 in addition to the generally accepted first parameter J which represents the loading level. It is demonstrated that with the constraint level included in the model effects of crack depth (shallow vs deep), specimen size (small vs. large), and loading type (uniaxial vs biaxial) on the fracture toughness from the test programs can be interpreted and predicted.

15902 (Y–2467-3) **Y-12 development organization technical progress report: Part 3 - metal processing, period ending September 1, 1994.** Northcutt, W.G. Jr. Oak Ridge National Lab., TN (United States). 8 Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009061. Source: OSTI; NTIS; GPO Dep.

The authors melted and cast an aluminum-uranium (Al-U) alloy by vacuum induction melting (VIM) prealloyed buttons made by arc melting. The resulting alloy casting displayed a large compositional gradient from top to bottom. The authors sampled the resulting casting for uranium to check homogeneity. The sampling revealed that the top of the casting contained 23.5 wt% uranium, and the bottom (an average of two samples) contained 42.4 wt% uranium. Although each button contained 36.5% uranium, these analyses show that the solidified casting was inhomogeneous. If the buttons were homogeneous, the segregation occurred during induction melting, and this method may not be feasible for making AL-U alloys. If the buttons were not homogeneous, perhaps arc melting the buttons more times would have helped. Bottom pouring the Al-U melt into a mold for faster cooling could also help prevent segregation.

15903 (Y/DV–1359) **A performance evaluation of coating systems for long term aqueous immersion service.** Pawel, S.J. Oak Ridge National Lab., TN (United States). 8 Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009060. Source: OSTI; NTIS; GPO Dep.

The static immersion of coated steel panels in various media representative of chemical and waste processes around the Oak Ridge Y-12 Plant was terminated after 16 months exposure for evaluation of coating performance and comparison with observations collected following 1, 6, and 11 months exposure. In each environment, a wide range of coating performance was observed, including some coatings unsuitable for use in the test environment (despite the high recommendation of the vendor). Further, coating performance as a function of time suggests a test duration of at least several months is required to fully assess candidate coating performance for specific applications. The performance of many coatings, particularly in the most alkaline environment, was adversely affected by the imposition of supplemental cathodic protection on the coated test panels.

3602 Ceramics, Cermets, and Refractories

Refer also to citation(s) 15726, 15748, 15849, 15883, 16295, 16297, 16963, 17024, 17032, 17049, 17110, 17195, 17204, 17226, 17231, 17233, 17234, 17236

15904 (BARC–1994/E/009) **Ion-bombardment etching of nuclear materials.** Rao, T.S. (Bhabha Atomic Research Centre, Bombay (India). Radiometallurgy Division); Kutty, T.R.G.; Pandey, V.D.; Ghosh, J.K. Bhabha Atomic Research Centre, Bombay (India). 1994. 18p. Order Number DE95627647. Source: OSTI; NTIS (US Sales Only); INIS.

Conventional chemical etching often presents difficulties in revealing the microstructure of some materials. Ion bombardment etching has helped in overcoming these difficulties in the metallographic preparation of nuclear ceramic materials. Metallographic examination has played a key role in supporting the nuclear fuel development and fabrication programme in the Radiometallurgy Division. A representative selection of photomicrographs obtained by ion-bombardment etching is presented in this report. (author). 2 refs., 1 tab., 20 figs.

15905 (CONF-9407153–Vol.1, pp. 206-238) **Two-powder processing of Bi-2223 - an update.** Dorris, S.E. (Argonne National Lab., IL (United States)); Pitz, M.A.; Dawley, J.; Lanagan, M.T.; Vasanthamohan, N.; Maroni, V.A.; Luo, J.S. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The patented two-powder process of ANL reproducibly yields more uniform and complete formation of Bi-2223 than does the typical mixed-phase powder process. In the two-powder process, intermediate precursors of lead-doped 2212 and $CaCuO_2$ (which decomposes to Ca_2CuO_3 + CuO) are made separately, then combined and reacted inside the silver sheath of powder-in-tube (PIT) specimens. This presentation describes efforts to increase the Jc of Bi-2223 PIT tapes by improving the alignment and connectivity of Bi-2223 grains. It will be shown that milling of precursor powders causes pickup of carbon, which resides at grain boundaries and disrupts grain-to-grain connectivity, but that the carbon-content can be reduced by vacuum calcination of the mixed powder (i.e. 2212 + $CaCuO_2$) before it is loaded into the silver tube. In addition, it is shown that slight changes in overall composition dramatically affect the final microstructures and may be important for improving the properties of tapes. Finally, a silver wire-in-tube method is described as a method for possibly improving grain alignment by increasing the interfacial area between silver and superconductor.

15906 (CONF-9407153–Vol.1, pp. 450-481) **Thick-film and power-in-tube processing for superconducting thallium oxide tape via an electrodeposition process.** Bhattacharya, R.N. (National Renewable Energy Lab., Golden, CO (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The electrodeposition process for fabricating superconducting thallium oxide tape is outlined. The following topics are discussed: advantages of the electrodeposition process, electrolyte composition for film composition, reproducibility and compositional uniformity, annealing of TBCCO film, electrodeposition powder process, influence of (PIT) thermomechanical processing on critical current density, and x-ray diffraction data. Conclusions and future plans are summarized.

15907 (CONF-9407153–Vol.1, pp. 682-690) **Phase stability of Tl, Pb-1223.** Aselage, T. (Sandia National Labs., Albuquerque, NM (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The phase stability of Tl, Pb-1223 was studied and presented in outline form. The following topics are discussed: background (BES), Tl-Ba-Ca-Cu-O phase diagrams, (Tl,Pb)-1223 stability region, and (Tl,Pb)-1223 properties change with P(Tl_2O). Future work is summarized.

15908 (CONF-941144–116) **Porous spherical shells and microspheres by electrodispersion precipitation.** Harris, M.T.; Sisson, W.G.; Basaran, O.A.; Hayes, S.M.; Bobrowski, S.J. Oak

Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009073. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to reproduce the synthesis of dense- and porous-microspheres and micron-sized spherical shells is very important in (a) the development of ceramics for structural, electronic, catalyst and thermal applications; and (b) the encapsulation of products for controlled-release of drugs, flavors and perfumes, and inks and dyes, and the protection of light-sensitive components and mechanical support of fragile materials. Larger metallic- and ceramic-spherical shells have been used in inertial confinement fusion (ICF) experiments and as catalyst supports. The current paper will focus on a recent technique that has been developed for synthesizing ceramic microspheres and micro-shells. Pulsed electric fields have been used to enhance the dispersion of aqueous metal (Zr and Al) salt solutions from a nozzle and into a nonconducting liquid continuous phase that is immiscible with the aqueous phase. The diameter of the resulting microdroplets ranged in size from approximately 0.1 to 10 μm. Precipitation of hydrous metal oxides occurred as ammonia, which was dissolved in varying amounts in the continuous phase, diffused into the aqueous microdroplets. Spherical shells were formed at higher ammonia concentrations and microspheres were produced at lower ammonia concentrations. Upon drying, dimples appeared in the particles that were synthesized at higher ammonia concentrations. The latter result accords with the well known fact that under certain conditions spherical shells collapse when a fluid is extracted from the core of the particle. No dimples were observed in the microspheres that were produced at lower ammonia concentrations. Analog X-ray dot maps for aluminum and zirconium were done to determine the spatial distribution of each metal in the particles.

15909 (CONF-941144–133) **Microstructure of Al_2O_3 irradiated with an applied electric field.** Zinkle, S.J.; Hunn, J.D.; Stoller, R.E. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95010278. Source: OSTI; NTIS; INIS; GPO Dep.

A thin amorphous film of alumina was irradiated with 2-MeV He^+ ions at ~400 C up to a damage level of about 0.01 displacements per atom (dpa). The alumina films were sufficiently thin (~1.8 μm) to allow the ion beam to be completely transmitted through the specimen. An electric field of ~280 V/mm (dc) was applied continuously during the irradiation. Radiation induced electrical degradation (RIED), i.e. a permanent increase in the conductance of the film, was observed in specimens irradiated at temperatures near 400 to 450 C but did not occur in a specimen irradiated above 500 C. Transmission electron microscopy found no evidence for colloid formation. The observed increase in the conductance of the alumina film may be due to radiation-induced microcracking.

15910 (CONF-950129–4) **Stress relaxation of silicon nitride at elevated temperatures.** Wereszczak, A.A. (Oak Ridge National Lab., TN (United States)); Ferber, M.K.; Kirkland, T.P.; Lara-Curzio, E.; Parthasarathy, V.; Gribb, T.T. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 19. annual conference on advanced ceramics, materials and structures; Cocoa Beach, FL (United States); 9-12 Jan 1995. Order Number DE95009177. Source: OSTI; NTIS; GPO Dep.

The stress relaxation behavior of SN88, SN253, and NCX-5102 silicon nitride materials were experimentally determined in tension at 1300°C using buttonhead specimens. Specimens were held at constant strain after being loaded at 10 MPa/s to an initial stress of 276 MPa (40 ksi) or 414 MPa (60 ksi). The subsequent decay in tensile stress was measured as a function of time. A non-negative least squares algorithm used in conjunction with a generalized Maxwell model proved to be an efficient means to define characteristic relaxation modulus spectra and stress relaxation behavior. In the last part of this study, the utility of using short-term stress relaxation testing to predict long-term creep performance was examined.

15911 (CONF-950129–6) **Gelcasting of sintered reaction-bonded silicon nitride for improved mechanical properties.** Maria, J.P.; Kiggans, J.O.; Tiegs, T.N.; Nunn, S.D. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 19. annual conference on advanced ceramics, materials and structures; Cocoa Beach, FL (United States); 9-12 Jan 1995. Order Number DE95010282. Source: OSTI; NTIS; GPO Dep.

Gelcasting of silicon metal for the production of sintered reaction bonded silicon nitride (SRBSN), was investigated in order to identify associated advantages over conventional forming techniques; i.e., die and isostatic pressing. Compacts were formed from identical powder mixtures by both gelcasting and pressing, and were nitrided and sintered to produce SRBSN ceramics. Characterization of the samples included measurement of green density, green and nitrided pore structure, weight gain during nitridation, final density, microstructure, toughness, and flexural strength. It was found that a more uniform pore structure existed in the green gelcast samples. It is believed that this pore configuration aided in nitridation, and manifested itself in a more uniform final microstructure. In addition, improved mechanical properties were achieved in the gelcast samples. This improvement can be attributed to green microstructure homogeneity.

15912 (CONF-950629–5) **Predictions of tensile behavior and strengths of a Si_3N_4 ceramic at high temperatures based on a viscoplastic model.** Liu, K.C. (Oak Ridge National Lab., TN (United States). Metals and Ceramics Division); Brinkman, R.; Ding, Jow-Lian; Lin, Shenghin. Oak Ridge National Lab., TN (United States); Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering. [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From ASME international gas turbine and aeroengine congress and exposition: land, sea and air; Houston, TX (United States); 5-8 Jun 1995. Order Number DE95010220. Source: OSTI; NTIS; GPO Dep.

Tensile deformation and rupture behavior were simulated using a viscoplastic model developed recently. The model was formulated based on the state variable approach, which provides flexibility and versatility for characterizing the time-dependent behavior of ceramic materials under general thermomechanical loading conditions. Simulations portrayed by the model were compared with experimental tensile data obtained under two different tensile stressing rates. Results showed that the model was capable of simulating deformation behavior for all practical engineering purposes, but estimated high-temperature fracture strengths somewhat conservatively.

15913 (DOE/CE/15599–T2) **Whisker reinforced glass ceramic. Quarterly progress report number 2, December 27, 1994–March 27, 1995.** Pickrell, G.R.; Brown, J.J. Jr. Materials Technologies of Virginia, Inc., Blacksburg, VA (United States). 25 Apr 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15599. Order Number DE95010542. Source: OSTI; NTIS; GPO Dep.

The goal of this project is to investigate the physical properties of an in-situ whisker reinforced glass ceramic material and to produce prototype heat exchanger tubes for testing in a coal combustion environment. The in-situ whisker reinforced glass ceramic process was developed and patented at Virginia Tech and licensed to MATVA. Successful completion of this project will demonstrate the potential for this new material to replace existing heat exchanger materials due to its superior chemical and physical properties. This report covers the progress made during this period. Topics covered here are glass melting and sample preparation. Density and microstructure results are given for samples.

15914 (DOE/ER–0313/16, pp. 493-504) **Radiation-induced changes in electric, dielectric and optical properties of ceramics.** Zinkle, S.J. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The data base on radiation-induced changes in the electric and dielectric properties of ceramic insulators is reviewed. Ionizing radiation causes a prompt increase in the electrical conductivity that is generally proportional to the ionizing dose rate. The precise magnitude of the radiation induced conductivity is sensitive to the detailed manufacturing process and impurity content. The conflicting evidence regarding the possibility of permanent radiation induced electrical degradation (RIED) is summarized. Further work is needed to define the physical mechanism and practical operating limits of the RIED phenomenon. Displacement damage associated with neutron irradiation produces significant increases in the room temperature dielectric loss tangent of oxide ceramics for fast neutron fluences above 1 x 10^{22} n/m^2 (~0.001 dpa). A brief summary of the effects of irradiation on the optical properties of ceramics and silica optical fibers is also presented.

15915 (DOE/ER–0313/16, pp. 512-516) **Electrical properties of Al_2O_3 during irradiation with spallation neutrons.** Farnum, E.H. (Los Alamos National Lab., NM (United States)); Clinard, F.W. Jr. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994*. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

DC and AC conductivity of Al_2O_3 ceramics were measured at elevated temperatures during irradiation with neutrons and gamma rays at the Los Alamos Spallation Radiation Effects Facility. DC conductivity was increased at start of irradiation, but was subsequently reduced as displacement damage was accumulated. AC conductivity appeared to increase at high levels of damage. The observed dc behavior is attributed to excitation of electrons into the conduction band by ionizing radiation, followed by charge trapping and recombination at damage sites. The ac behavior, which resembles RIED, is attributed to conductivity in the residual gas surrounding the samples. Surface conductivity, while not the source of the apparent RIED, nevertheless is of sufficient magnitude to be of concern for fusion applications.

15916 (DOE/ER–0313/16, pp. 523-527) **Neutron-induced changes in optical properties of $MgAl_2O_4$ spinel.** Ibarra, A. (CIEMAT, Madrid (Spain)); Garner, F.A. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994*. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

High purity $MgAl_2O_4$ spinel specimens irradiated in FFTF-MOTA to very high exposure have been examined by three techniques to determine changes in their optical properties. Significant changes were observed in optical absorption, photoluminescence and radioluminescence.

15917 (ENEA-RT-INN–94-46) **Enea contribution to development of sol-gel technologies.** Vatteroni, R. (ENEA, Casaccia (Italy). Area Energia e Innovazione); Arcangeli, G.; Borrello, A.; Majani, C.; Picconi, C. ENEA, Casaccia (Italy). Area Energia e Innovazione. Nov 1994. 35p. (RT/INN–94-46). Order Number DE95771031. Source: OSTI; NTIS (US Sales Only).

Compared with conventional ceramic processes, the Sool-Gel technology, invented at the end of sixties for the preparation of ceramic nuclear fuel, seems suitable for obtaining pure and homogeneous fine grade precursors with a deeper control of chemical purity and crystallinity. In the frame of some agreements with other italianrResearch institutes, ENEA (Italian Agency for New Technologies, Energy and Environment) has applied the Sol-Gel technologies to the development of a few advanced ceramic materials; some of these particular applications are described in this report.

15918 (INIS-BR–3502) **The effects of additives (MgO, La_2O_3 and Y_2O_3) in the translucency of alumina.** Genova, L.A.; Bressiani, A.H.A.; Bressiani, J.C. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1993. 11p. (CONF-9308265–: Seminar on Technology Capacity of Materials, Sao Paulo (Brazil), 19 Aug 1993). Order Number DE95627670. Source: OSTI; NTIS (US Sales Only); INIS.

The effect of the addition of small amounts of Mg O, La_2O_3 and Y_2O_3 in the optical characteristics of the high purity alumina has been studied. Specimens with high transmittance in the visible region has been obtained. High purity alumina powders have also been obtained through the crystallization of ammonium alum. Translucent samples have been produced from these powders. (author). 6 refs, 5 figs, 4 tabs.

15919 (IS-M–812) **Superconductivity, magnetism and metal-insulator transitions in some ternary and pseudoternary 3d-, 4d- and 5d-metal oxides.** Johnston, D.C. (Ames Lab., IA (United States)); Borsa, F.; Kim, K.H.; Manajan, A.V.; Miller, L.L.; Torgeson, D.R.; Wang, Z.R.; Ami, T.; Crawford, M.K.; Hariow, R.L. Oak Ridge National Lab., TN (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; W-7405-ENG-82. (CONF-9410283–1: 17. international Taniguchi symposium on theoretical physics on spectroscopy of Mott Insulators and Correlated Metals, Shima (Japan), 24-29 Oct 1994). Order Number DE95005904. Source: OSTI; NTIS; INIS; GPO Dep.

Electron conduction effects have been found to be particularly important in the metallic compounds LiV_2O_4 and possibly $Sr_2Ir_{1-x}Ru_xO_4$ ($x > 0.7$), but not in metallic $Sr_{1-x}La_xVO_3$ ($x < 0.7$), and they cause the compounds Sr_2IrO_4 and ZnV_2O_4 to be (Mott-Hubbard) insulators. The LiV_2O_4 spinel compound is especially interesting, because the V ions exhibit rather clear local moment ($S = 1/2$) behavior even though the compound is a metal. 6 figures, 30 references.

15920 (IS-M–814) **Phase transformations in melt-spun Y-Ba-Cu-O bulk superconductor.** Wu, H.; Kramer, M.J.; Dennis, K.W.; McCallum, R.W. Ames Lab., IA (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-941013–34: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95010237. Source: OSTI; NTIS; GPO Dep.

Powders of $YBa_2Cu_3O_7$ (Y123) and compositions around Y123 were heated by a containerless process and melt-spun in 21% oxygen atmosphere at temperatures of 1400 to 1650 C. Homogeneous materials were obtained with micron and submicron crystalline phases uniformly dispersed in an amorphous matrix. For Y123, the crystalline phases are identified by XRD as $BaCu_2O_2$ and Y_2O_3 when the melt-spinning temperature is below 1600 C. At 1650 C, the crystalline phases are $Y_4Ba_3O_9$, $BaCu_2O_2$ and Y_2O_3. The phase composition of the solidified melt is directly related to the oxygen content of the melt and can be related to the equilibrium phase diagrams at lower oxygen partial pressures. Isothermal annealing is oxygen at temperatures 500 to 950 C reveals that the crystallization sequence is: Y123 begins to form at 500 C, Y123 with minor amount of Y_2BaCuO_5 at 800 C, Y123 with very minor amount of CuO at 900 C, and single phase Y123 at 950 C.

15921 (IS-M–816) **Anisotropic magnetization of $HoNi_2B_2C$.** Canfield, P.C. (Ames Lab., IA (United States)); Cho, B.K.; Johnston, D.C.; Hundley, M.F. Ames Lab., IA (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-941144–124: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95010239. Source: OSTI; NTIS; GPO Dep.

Anisotropic, temperature dependent magnetization measurements on single crystals of $HoNi_2B_2C$ indicate that there is a cascade of magnetic transitions in zero and low applied magnetic fields. Comparison of the temperature dependence of the specific heat and $d(\chi T)/dT$ data shows a remarkable agreement in the low field limit, supporting the use of $d(\chi T)/dT$ as a method of determining the magnetic transition temperatures as a function of applied field. The magnetic transition temperatures determined by this analysis are remarkably sensitive to the applied field and highly anisotropic. Comparison to similar data for $ErNi_2B_2C$ show that the sensitivity and anisotropy are common features. These data emphasize the importance of anisotropic measurements of field dependent properties on single crystal samples, since the application of a magnetic field to a polycrystalline sample will effectively broaden the transition temperatures.

15922 (IS-T–1719) **A metallurgical approach toward alloying in rare earth permanent magnet systems.** Branagan, D.J.

Ames Lab., IA (United States). 23 Feb 1995. 274p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010242. Source: OSTI; NTIS; GPO Dep.

The approach was developed to allow microstructural enhancement and control during solidification and processing. Compound additions of Group IVA, VA, or VIA transition metals (TM) and carbon were added to $Nd_2Fe_{14}B$ (2-14-1). Transition metal carbides formed in IVA (TiC, ZrC, HfC) and Group VA (VC, NbC, TaC) systems, but not in the VIA system. The alloying ability of each TM carbide was graded using phase stability, liquid and equilibrium solid solubility, and high temperature carbide stability. Ti with C additions was chosen as the best system. The practically zero equilibrium solid solubility means that the Ti and C additions will ultimately form TiC after heat treatment which allows the development of a composite microstructure consisting of the 2-14-1 phase and TiC. Thus, the excellent intrinsic magnetic properties of the 2-14-1 phase remain unaltered and the extrinsic properties relating to the microstructure are enhanced due to the TiC stabilized microstructure which is much more resistant to grain growth. When Ti + C are dissolved in the liquid melt or solid phases, such as the glass or 2-14-1 phase, the intrinsic properties are changed; favorable changes include increased glass forming ability, reduced optimum cooling rate, increased optimum energy product, and enhanced nucleation kinetics of crystallization.

15923 (IS-T–1729) **Processing and characterization of nanocrystalline molybdenum disilicide ($MoSi_2$) consolidated by hot isostatic pressing (HIP).** Haji-Mahmood, M.S. Ames Lab., IA (United States). 10 Feb 1995. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010243. Source: OSTI; NTIS; GPO Dep.

This work studied the effect nanocrystalline processing may have on mechanical properties of $MoSi_2$ and the ease with which $MoSi_2$ powder can be processed into a bulk shape. ($MoSi_2$ presently is limited by poor strength above 1000 C and brittleness below DBTT.) This work studied cold and hot isostatic pressing (CIP, HIP). The attrited, CIPed, and HIPed samples were characterized by chemical analysis, XRD, SEM, microhardness, optical microscopy, and quantitative metallography (porosity, density). Fracture toughness of the nanocrystalline $MoSi_2$ was found to be a factor of two higher than conventional $MoSi_2$ and the hardness of 1500 C-HIPed compacts were higher, as well. Modulus test showed the calculated elastic constants to be higher than the original Cerac material.

15924 (JINR-D–14-94-269(v.1), pp. 3-4) **Influence of real structure and temperature on specific features of luminescence in $YBa_2Cu_3O_{7-\delta}$ HTSC.** Avdeenko, A.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Eremenko, V.V.; Zinov'ev, P.V.; Silaeva, N.B.; Sukhareva, T.V.; Tiunov, Yu.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 4 figs. HIGH-TC SUPERCONDUCTORS/luminescence; BARIUM OXIDES; CERAMICS; COPPER OXIDES; ENERGY SPECTRA; LUMINESCENCE; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15925 (JINR-D–14-94-269(v.1), pp. 10-11) **Magnetoresistance of YBCO in a normal state. Relation to superconducting properties.** Amitin, E.B. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Blinov, A.G.; Dikovskij, V.Ya.; Zhdanov, K.R.; Naumov, V.N.; Frolova, G.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/magnetoresistance; BARIUM OXIDES; CONCENTRATION RATIO; COPPER OXIDES; MAGNETORESISTANCE; MAGNETIC FIELDS; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15926 (JINR-D–14-94-269(v.1), pp. 12-13) **Magnetoresistance anisotropy in single crystals of $YBa_2Cu_3O_x$ system in a normal state.** Amitin, E.B. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Blinov, A.G.; Boyarskij, L.A.; Dikovskij, V.Ya.; Zhdanov, K.R.; Kameneva, M.Yu.; Kochergin, O.M.; Naumov, V.N.; Frolova, G.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 3 figs. HIGH-TC SUPERCONDUCTORS/anisotropy; HIGH-TC SUPERCONDUCTORS/magnetoresistance; ANGULAR DISTRIBUTION; BARIUM OXIDES; COPPER OXIDES; ANISOTROPY; MAGNETORESISTANCE; MAGNETIC FIELDS; MONOCRYSTALS; ORIENTATION; YTTRIUM OXIDES

15927 (JINR-D–14-94-269(v.1), pp. 14-15) **Lateral magnetoresistance of YBCO single crystals with various oxygen contents.** Amitin, E.B. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Blinov, A.G.; Boyarskij, L.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 3 figs., 1 tab. HIGH-TC SUPERCONDUCTORS/magnetoresistance; BARIUM OXIDES; CHEMICAL COMPOSITION; CONCENTRATION RATIO; COPPER OXIDES; MAGNETORESISTANCE; MAGNETIC FIELDS; MONOCRYSTALS; ORIENTATION; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15928 (JINR-D–14-94-269(v.1), pp. 19-20) **Transport properties of superconducting single crystal filaments in a glass shell.** Arutyunov, K.Yu. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Danilova, N.P.; Nikolaeva, A.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 2 figs. INDIUM/electric conductivity; INDIUM/whiskers; TIN/electric conductivity; TIN/whiskers; COMPOSITE MATERIALS; ELECTRIC CURRENTS; FILAMENTS; GLASS; INDIUM; WHISKERS; TIN

15929 (JINR-D–14-94-269(v.1), pp. 21-22) **Isotopic shift of T_c in LSCO with 3d-impurities.** Babushkina, N.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Zhernov, A.P.; Inyushkin, A.V.; Ozhogin, V.I.; Taldenkov, A.N.; Molchanova, L.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on*

low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC. Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. SUPERCONDUCTORS/impurities; SUPERCONDUCTORS/transition temperature; CONCENTRATION RATIO; COPPER OXIDES; LANTHANUM OXIDES; SPECTRAL SHIFT; STRONTIUM OXIDES; SUPERCONDUCTORS; IMPURITIES; TEMPERATURE RANGE 0013-0065 K

15930 (JINR-D–14-94-269(v.1), pp. 23) **Nonmonotoneous changes of critical temperature in $(Bi_{0.8}Pb_{0.2})_2Ca_2Sr_2Cu_3O_{10}$ superconductor under low dose irradiation.** Bakuntseva, M.V. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Metallofiziki); Vasil'ev, M.A.; Gorelov, B.M.; Dyakin, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/physical radiation effects; HIGH-TC SUPERCONDUCTORS/transition temperature; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; DOSE-RESPONSE RELATIONSHIPS; GAMMA RADIATION; LEAD OXIDES; RADIATION DOSES; STRONTIUM OXIDES

15931 (JINR-D–14-94-269(v.1), pp. 24) **Magnetic phase diagram of $YBa_2(Cu_{1-x}Fe_x)_3O_{6+y}$ superconductor in wide ranges of temperature and iron and oxygen contents.** Balagurov, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Lyubutin, I.S. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/magnetic properties; BARIUM OXIDES; CONCENTRATION RATIO; COPPER OXIDES; DIAGRAMS; IRON OXIDES; MAGNETISM; SPIN GLASS STATE; YTTRIUM OXIDES

15932 (JINR-D–14-94-269(v.1), pp. 25) **Formation of 'low radius' bipolarous and thermodynamic properties of cuprate HTSC.** Balankina, E.S. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Bychkov, Yu.F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/structural models; HIGH-TC SUPERCONDUCTORS/thermodynamic properties; CUPRATES; LATTICE VIBRATIONS; PHASE TRANSFORMATIONS; POLARONS

15933 (JINR-D–14-94-269(v.1), pp. 26) **Compressiblity and phase transitions in $YBa_2Cu_3O_x$.** Balankina, E.S. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Bychkov, Yu.F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/compressibility; HIGH-TC SUPERCONDUCTORS/phase transformations; BARIUM OXIDES; COPPER OXIDES; CRYSTAL LATTICES; COMPRESSIBILITY; ORDER PARAMETERS; STRESSES; YTTRIUM OXIDES

15934 (JINR-D–14-94-269(v.1), pp. 27-28) **Specific features of nonlinear interaction of electromagnetic waves in rigid superconductors.** Baltaga, I.V. (AN Ukrainskoj SSR, Kharkov (Ukraine). Inst. Radiofiziki i Ehlektroniki); Il'enko, K.V.; Yampol'skij, V.A.; Voloshin, I.F.; Fisher, L.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/electromagnetic interactions; CRITICAL CURRENT; ELECTRIC FIELDS; ELECTROMAGNETIC RADIATION; IMPEDANCE; MAGNETIC FIELDS; MAGNETIC PROPERTIES

15935 (JINR-D–14-94-269(v.1), pp. 29-30) **Behaviour of critical current in Bi-base superconducting wires under electron irradiation.** Barabanov, S.N.; Davlat'yan, T.A.; Kalashnikov, V.V.; Tokarev, A.S. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/critical current; HIGH-TC SUPERCONDUCTORS/physical radiation effects; BISMUTH OXIDES; CERAMICS; COPPER OXIDES; DOSE-RESPONSE RELATIONSHIPS; ELECTRONS; TEMPERATURE RANGE 0273-0400 K

15936 (JINR-D–14-94-269(v.1), pp. 36-37) **Electron and phonon characteristics based on precision data on specific heat for $YBa_2Cu_3O_{7-\delta}$.** Bessergenev, V.G. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Kovalevskaya, Yu.A.; Naumov, V.N.; Frolova, G.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 tab. HIGH-TC SUPERCONDUCTORS/electron-phonon coupling; HIGH-TC SUPERCONDUCTORS/specific heat; BARIUM OXIDES; CERAMICS; COPPER OXIDES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15937 (JINR-D–14-94-269(v.1), pp. 38-39) **Current passing pattern and low-frequency noise in YBaCuO films with B-oriented inclusions.** Bobyl', A.V. (Leningradskij Politekhnicheskij Inst., Leningrad (Russian Federation)); Gaevskij, M.Eh.; Shantsev, D.V.; Kyutt, R.N.; Solov'ev, V.A.; Suris, R.A.; Tkachenko, A.D.; Khrebtov, I.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 tab. HIGH-TC SUPERCONDUCTORS/electric conductivity; HIGH-TC SUPERCONDUCTORS/grain orientation; BARIUM OXIDES; COPPER OXIDES; NOISE; RESIDUAL STRESSES; SUPERCONDUCTING FILMS; TEMPERATURE

DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15938 (JINR-D–14-94-269(v.1), pp. 40-41) **Flicker noise of normal phase in $YBa_2Cu_3O_{7-\delta}$ films on various substrates.** Bobyl', A.V. (Leningradskij Politekhnicheskij Inst., Leningrad (Russian Federation)); Gaevskij, M.Eh.; Karmanenko, S.F.; Kyutt, R.N.; Suris, R.A.; Tkachenko, A.D.; Khrebtov, I.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HIGH-TC SUPERCONDUCTORS/lattice parameters; HIGH-TC SUPERCONDUCTORS/residual stresses; BARIUM OXIDES; COPPER OXIDES; CRYSTAL STRUCTURE; NOISE; ORDER-DISORDER TRANSFORMATIONS; STRAINS; SUBSTRATES; SUPERCONDUCTING FILMS; THERMAL EXPANSION; YTTRIUM OXIDES

15939 (JINR-D–14-94-269(v.1), pp. 48-49) **Study of physicotechnological bases of production of HTSC film structures.** Bochkarev, V.F.; Naumov, V.V.; Goryachev, A.A.; Trushin, O.S.; Timofeeva, L.Yu.; Mul, V.V.; Kozyrev, A.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. SUPERCONDUCTING FILMS/fabrication; BARIUM OXIDES; CHEMICAL COMPOSITION; COPPER OXIDES; EPITAXY; HIGH-TC SUPERCONDUCTORS; ORIENTATION; SUBSTRATES; FABRICATION; YTTRIUM OXIDES

15940 (JINR-D–14-94-269(v.1), pp. 53) **Study of yttrium and mercury solubility and diffusion in $YBa_2Cu_3O_{7-\delta}$.** Vasil'ev, M.A. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Metallofiziki); Bakuntseva, M.V.; Gorbik, P.P.; Dubrovin, I.V.; Dyakin, V.V.; Zaitov, F.A.; Lagutina, I.V.; Shalyapina, G.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/diffusion; HIGH-TC SUPERCONDUCTORS/solubility; BARIUM OXIDES; COPPER OXIDES; DIFFUSION; SOLUBILITY; MERCURY 203; POLYCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0400-1000 K; YTTRIUM ISOTOPES; YTTRIUM OXIDES

15941 (JINR-D–14-94-269(v.1), pp. 54) **Threshold variation of chemical composition and surface morphology in $(Pb_xBi_{1-x})_2Sr_2Ca_2Cu_3O_y$ ceramics under electron irradiation.** Vasil'ev, M.A. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Metallofiziki); Bakuntseva, M.V.; Mishchuk, O.A.; Gorelov, B.M.; Gorbik, P.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/physical radiation effects; BEAM CURRENTS; BISMUTH OXIDES; CALCIUM OXIDES; CERAMICS; CHEMICAL COMPOSITION; COPPER OXIDES; DOSE-RESPONSE RELATIONSHIPS; ELECTRON BEAMS; LEAD OXIDES; MICROSTRUCTURE; RADIATION DOSES; STRONTIUM OXIDES

15942 (JINR-D–14-94-269(v.1), pp. 55-56) **Search for new superconducting materials with the use of magnetically dependent microwave absorption.** Vejnger, A.I. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Zabrodskij, A.G.; Tisnek, T.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. SUPERCONDUCTORS/superconductivity; ABSORPTION SPECTRA; CERAMICS; CRITICAL FIELD; GLASS; MEASURING METHODS; MICROWAVE SPECTRA; SUPERCONDUCTORS; SUPERCONDUCTIVITY; TRANSITION TEMPERATURE

15943 (JINR-D–14-94-269(v.1), pp. 59-60) **Study into the effect of calcium alloying on energy spectrum of $YBa_2Cu_3O_y$ by the complex method of electron transport phenomenon investigation.** Vladimirskaya, E.V. (Leningradskij Politekhnicheskij Inst., Leningrad (Russian Federation)); Gasumyants, V.Eh.; Baranskaya, N.P.; Patrina, I.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/calcium additions; HIGH-TC SUPERCONDUCTORS/superconductivity; BARIUM OXIDES; CERAMICS; COPPER OXIDES; ELECTRON TRANSFER; ELECTRONIC STRUCTURE; SUPERCONDUCTIVITY; THERMOELECTRIC PROPERTIES; YTTRIUM OXIDES

15944 (JINR-D–14-94-269(v.1), pp. 62-63) **Study of quasi-two-dimensional properties of Bi-2212 HTSC phase with the help of mutually perpendicular currents.** Volkov, A.Yu.; Kamentsev, K.E.; Bush, A.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/charge transport; HIGH-TC SUPERCONDUCTORS/critical current; BARIUM OXIDES; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; ELECTRIC CONDUCTIVITY; MAGNETIC FLUX; MONOCRYSTALS; ORIENTATION; STRONTIUM OXIDES

15945 (JINR-D–14-94-269(v.1), pp. 64-65) **Volt-ampere characteristics of YBaCuO epitaxial films in the range of superconducting transition.** Volkov, M.P. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Prokof'ev, D.D.; Bojkov, Yu.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. SUPERCONDUCTING FILMS/electric conductivity; BARIUM OXIDES; COPPER OXIDES; CRITICAL CURRENT; GRAIN ORIENTATION; HIGH-TC

SUPERCONDUCTORS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; THIN FILMS; YTTRIUM OXIDES

15946 (JINR-D–14-94-269(v.1), pp. 66-67) **Anisotropy of critical current in YBCO textured specimens.** Voloshin, I.F. (Vsesoyuznyj Ehlektrotekhnicheskij Inst., Moscow (Russian Federation)); Fisher, L.M.; Mirkovich, J. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/anisotropy; HIGH-TC SUPERCONDUCTORS/critical current; BARIUM OXIDES; COPPER OXIDES; CRYSTAL GROWTH; GRAIN ORIENTATION; ANISOTROPY; MAGNETIC FIELDS; MAGNETIC FLUX; TEMPERATURE RANGE 0065-0273 K; TEXTURE; YTTRIUM OXIDES

15947 (JINR-D–14-94-269(v.1), pp. 70) **Production of long-sized $Y_1Ba_2Cu_3O_{7-\delta}$ HTSC crystals and their properties.** Voloshin, I.F. (Moskovskij Ehnergeticheskij Inst., Moscow (Russian Federation)); Fisher, L.M.; Drozdov, Yu.N.; Churin, S.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HIGH-TC SUPERCONDUCTORS/critical current; HIGH-TC SUPERCONDUCTORS/crystal structure; HIGH-TC SUPERCONDUCTORS/yttrium oxides; BARIUM OXIDES; COPPER OXIDES; CRYSTALLIZATION; CRYSTALS; GRAIN ORIENTATION; TRANSITION TEMPERATURE

15948 (JINR-D–14-94-269(v.1), pp. 71-72) **Interrelation between T_c and anisotropy of $La_{2-x}Sr_xCuO_4$ crystal lattice on radiation induced disordering.** Voronin, V.I. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Mirmel'shtejn, A.V.; Kar'kin, A.E.; Goshchitskij, B.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HIGH-TC SUPERCONDUCTORS/physical radiation effects; HIGH-TC SUPERCONDUCTORS/transition temperature; ANISOTROPY; BINDING ENERGY; COPPER OXIDES; CRYSTAL LATTICES; FAST NEUTRONS; LANTHANUM OXIDES; ORDER-DISORDER TRANSFORMATIONS; STRONTIUM OXIDES; TEMPERATURE RANGE 0065-0273 K

15949 (JINR-D–14-94-269(v.1), pp. 73-74) **Thick films of $YBa_2Cu_3O_{7-\delta}$ produced on Y_2BaCuO_5 substrate by painting: technology, properties, applications.** Vyong, N.V.; Raspopina, E.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. SUPERCONDUCTING FILMS/sintering; SUPERCONDUCTING FILMS/transition temperature; CRITICAL CURRENT; CRYSTAL LATTICES; DENSITY; HIGH-TC SUPERCONDUCTORS; PAINTS; SINTERING; THERMAL DEGRADATION; THICKNESS

15950 (JINR-D–14-94-269(v.1), pp. 77-78) **Study of coefficient of thermo-emf in bismuth HTSC materials in the temperature range of T_c-1000 K.** Gasumyants, V.Eh. (Leningradskij Politekhnicheskij Inst., Leningrad (Russian Federation)); Vladimirskaya, E.V.; Smirnov, V.I.; Kazanskij, S.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/thermoelectric properties; BISMUTH OXIDES; CALCIUM OXIDES; CERAMICS; COPPER OXIDES; ELECTRONIC STRUCTURE; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; TEMPERATURE RANGE 0400-1000 K

15951 (JINR-D–14-94-269(v.1), pp. 80-81) **Magnetostriction oscillations in manganese doped bismuth ceramics of 2223 type.** Gitsu, D. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki); Kantser, V.; Konopko, L.; Panaitov, G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. HIGH-TC SUPERCONDUCTORS/magnetostriction; BISMUTH OXIDES; CALCIUM OXIDES; CERAMICS; MAGNETOSTRICTION; LEAD OXIDES; MAGNETIC FIELDS; MANGANESE ADDITIONS; OSCILLATIONS; STRONTIUM OXIDES

15952 (JINR-D–14-94-269(v.1), pp. 82-83) **Nonequilibrium and bolometric response of YBaCuO films in a resistive state to infrared low intensity radiation.** Gershenzon, E.M. (Moskovskij Gosudarstvennyj Pedagogicheskij Inst., Moscow (Russian Federation)); Gol'tsman, G.N.; Zorin, M.A.; Karasik, B.S.; Trifonov, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/laser radiation; HIGH-TC SUPERCONDUCTORS/physical radiation effects; BARIUM OXIDES; COPPER OXIDES; ELECTRON-PHONON COUPLING; FREQUENCY DEPENDENCE; MHZ RANGE; PULSES; RESPONSE FUNCTIONS; THIN FILMS; TIME DEPENDENCE; YTTRIUM OXIDES

15953 (JINR-D–14-94-269(v.1), pp. 89-90) **Dielectric resonance in $YBa_2Cu_3O_{7-x}$ specimens in UHF electromagnetic field.** Golyamina, E.M. (AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.); Dravin, V.A.; Zhurkin, B.G.; Karuzskij, A.L.; Lykov, A.N.; Murzin, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/dielectric properties; BARIUM OXIDES; COPPER OXIDES; NIOBIUM; RESONANCE; SHORT WAVE RADIATION; YTTRIUM OXIDES

15954 (JINR-D–14-94-269(v.1), pp. 97) **Superconducting phase formation on chemical deposition of HTSC coating.** Gorbik, P.P.; Dubrovin, I.V.; Dyakin, V.V.; Laguta, I.V.; Levchenko, A.A.; Lysenko, V.N.; Ogenko, V.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/chemical coating; SUPERCONDUCTING FILMS/transition temperature; BARIUM OXIDES; COPPER OXIDES; GRAIN ORIENTATION; HEAT TREATMENTS; HIGH-TC SUPERCONDUCTORS; PYROLYSIS PRODUCTS; SUPERCONDUCTIVITY; YTTRIUM OXIDES

15955 (JINR-D–14-94-269(v.1), pp. 98-99) **Interference of transport and shielding currents in $Bi_2Sr_2CaCu_2O_x$ single crystals.** Gordeev, S.N. (Moskovskij Inst. Radiotekhniki, Ehlektroniki i Avtomatiki, Moscow (Russian Federation)); Zhukov, A.A.; Kupfer, H.; Jan, V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. HIGH-TC SUPERCONDUCTORS/electric conductivity; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; MAGNETIC FIELDS; MONOCRYSTALS; STRONTIUM OXIDES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K

15956 (JINR-D–14-94-269(v.1), pp. 100) **Effect of γ-irradiation on element composition of $(Bi_{0.8}Pb_{0.2})_2Sr_2Ca_2Cu_3O_{10}$ HTSC surface.** Gorelov, B.M.; Vasil'ev, M.A.; Mishchuk, O.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/chemical composition; HIGH-TC SUPERCONDUCTORS/radiation effects; BISMUTH OXIDES; CERAMICS; COPPER OXIDES; GAMMA RADIATION; RADIATION DOSES; STRONTIUM OXIDES; SURFACES

15957 (JINR-D–14-94-269(v.1), pp. 101-102) **Influence of physical and chemical adsorption of H_2O molecules on phase state of $YBa_2Cu_3O_{7-\delta}$ HTSC.** Gorelov, B.M. (Kievskij Politekhnicheskij Inst., Kiev (Ukraine)); Dyakin, V.V.; Borisov, V.N.; Pashkov, V.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. HIGH-TC SUPERCONDUCTORS/chemisorption; HIGH-TC SUPERCONDUCTORS/phase studies; ADSORPTION; BARIUM OXIDES; COPPER OXIDES; ELECTRIC CONDUCTIVITY; CHEMISORPTION; SURFACES; TEMPERATURE RANGE 0065-0273 K; WATER; YTTRIUM OXIDES

15958 (JINR-D–14-94-269(v.1), pp. 105-106) **Influence of matrix composition on superconducting properties of SnTe base solid solutions alloyed with indium.** Drabkin, I.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Parfen'ev, R.V.; Popov, D.I.; Safonchik, M.O.; Smirnov, I.Yu.; Shamshur, D.V.; Shakhov, M.A.; Nemov, S.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 fig. TIN TELLURIDES/superconductivity; ELECTRONIC STRUCTURE; INDIUM ADDITIONS; SOLID SOLUTIONS; SPECIFIC HEAT; TEMPERATURE RANGE 0000-0013 K; TIN SELENIDES; SUPERCONDUCTIVITY; TRANSITION TEMPERATURE

15959 (JINR-D–14-94-269(v.1), pp. 107-108) **The line of irreversibility and dissipative losses in YBCO epitaxial film.** Dobrot'ko, V.F. (AN Ukrainskoj SSR, Donetsk (Ukraine). Fiziko-Tekhnicheskij Inst.); Khokhlov, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. SUPERCONDUCTING FILMS/energy losses; BARIUM OXIDES; COPPER OXIDES; CRITICAL CURRENT; DIAMAGNETISM; DISSIPATION FACTOR; EPITAXY; HIGH-TC SUPERCONDUCTORS; YTTRIUM OXIDES

15960 (JINR-D–14-94-269(v.1), pp. 109-110) **Study of penetration depth of magnetic field in bismuth base HTSC by μSR method.** Duginov, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15961 (JINR-D–14-94-269(v.1), pp. 111-112) **Dependence of charge-transfer gap on pressure in insulators - the analogues of high temperature superconductors.** Elesin, V.F. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Krasheninnikov, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HIGH-TC SUPERCONDUCTORS/energy gap; CHARGE CARRIERS; CUPRATES; ELECTRONIC STRUCTURE; ENERGY-LEVEL DENSITY; FERMI LEVEL; HIGH PRESSURE; PRESSURE DEPENDENCE

15962 (JINR-D–14-94-269(v.1), pp. 113) **Low temperature magnetic ordering in $YBa_2Cu_3O_{6.9}$ irradiated by fast neutrons.** Zhdanov, Yu.I. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Verkhovskij, S.V.; Mikhalev, K.N.; Aleksashin, B.A.; Lavrent'ev, V.V.; Bogdanovich, A.M.; Serikov, V.V.; Sadovskij, M.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/physical radiation effects; BARIUM OXIDES; COPPER OXIDES; FAST NEUTRONS; MAGNETIC SUSCEPTIBILITY; ORDER-DISORDER TRANSFORMATIONS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15963 (JINR-D–14-94-269(v.1), pp. 118-119) **Krypton irradiation effect on pinning and creep in $Bi_2Sr_2CaCu_2O_x$ single crystals.** Zhukov, A.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Rybachuk, V.A.; Kalinov, A.V.; Murashov, V.A.; Goncharov, I.N.; Kupfer, Kh.; Vil', A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 figs. HIGH-TC SUPERCONDUCTORS/magnetic flux; HIGH-TC SUPERCONDUCTORS/radiation effects; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; KRYPTON IONS; MEV RANGE 100-1000; MONOCRYSTALS; RADIATION DOSES; RELAXATION; STRONTIUM OXIDES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K

15964 (JINR-D–14-94-269(v.1), pp. 123-124) **Kinetic equations and temperature dependence of electric conductivity in HTSC normal phase.** Zajtsev, R.O. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Mikhajlova, Yu.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/electric conductivity; CERIUM OXIDES; COPPER OXIDES; FERMI LEVEL; KINETIC EQUATIONS; NEODYMIUM OXIDES; TEMPERATURE DEPENDENCE

15965 (JINR-D–14-94-269(v.1), pp. 125-126) **Dilatometry of $YBa_2Cu_3O_{6+x}$ in magnetic field.** Ivanchenko, L.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Sirenko, V.A.; Popov, V.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15966 (JINR-D–14-94-269(v.1), pp. 129-130) **Influence of Re electron spectrum fine structure on superconducting transition temperature T_k of Re-Mo and Re-Os alloys.** Ignat'eva, T.A.; Velikodnyj, A.N.; Yankovskij, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. RHENIUM/energy spectra; RHENIUM ALLOYS/transition temperature; BINARY ALLOY SYSTEMS; CONCENTRATION RATIO; FERMI LEVEL; FINE STRUCTURE; MOLYBDENUM ALLOYS; OSMIUM ALLOYS; RHENIUM; SUPERCONDUCTIVITY

15967 (JINR-D–14-94-269(v.1), pp. 131-132) **Optical conductivity in HTSC-analysis of polaron contribution.** Kabanov, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15968 (JINR-D–14-94-269(v.1), pp. 133) **The first and the second critical fields in fast neutron $YBa_2Cu_3O_x$ and $NbSe_2$.** Kar'kin, A.E. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Chebotaev, N.M.; Veber, Kh. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15969 (JINR-D–14-94-269(v.1), pp. 136-137) **Sensitive technique of studying fine superconducting structure of HTSC materials.** Keshka, B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HIGH-TC SUPERCONDUCTORS/phase studies; HIGH-TC SUPERCONDUCTORS/superconductivity; BARIUM OXIDES; COPPER OXIDES; CRITICAL FIELD; GRANULAR MATERIALS; SUPERCONDUCTIVITY; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; TRANSITION TEMPERATURE; YTTRIUM OXIDES

15970 (JINR-D–14-94-269(v.1), pp. 142-143) **Dependence of shielding currents and critical temperature on thickness of $YBa_2Cu_3O_{7-\delta}$ single crystals.** Klestov, S.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Zhukov, A.A.; Voronkova, V.I.; Gordeev, S.N.; Kupfer, H.; Wolf, T. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 2 figs. HIGH-TC SUPERCONDUCTORS/magnetization; HIGH-TC SUPERCONDUCTORS/superconductivity; BARIUM OXIDES; COPPER OXIDES; MAGNETIZATION; SUPERCONDUCTIVITY; MAGNETIC FIELDS; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273

K; THICKNESS; TRANSITION TEMPERATURE; YTTRIUM OXIDES

15971 (JINR-D–14-94-269(v.1), pp. 144-145) **Some aspects of improving superconducting properties of Y-123 bulk single crystals.** Kozeeva, L.P. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Pavlyuk, A.A.; Starikov, M.A.; Samojlov, P.P.; Mazhara, A.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HIGH-TC SUPERCONDUCTORS/crystal growth; HIGH-TC SUPERCONDUCTORS/transition temperature; BARIUM OXIDES; COPPER OXIDES; MONOCRYSTALS; PHASE STUDIES; SUPERCONDUCTIVITY; SYNTHESIS; YTTRIUM OXIDES

15972 (JINR-D–14-94-269(v.1), pp. 148-149) **Pulsed electron and ion irradiation effect on electrical properties of films of Y-Ba-Cu-O and Bi-Ca-Sr-Cu-O superconductors produced in a pulse ion diode.** Korenev, S.A.; Malakhov, N.A.; Pilyar, N.V.; Raspopina, E.V.; Sikolenko, V.V.; Yaradajkin, S.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/critical current; HIGH-TC SUPERCONDUCTORS/physical radiation effects; BARIUM IONS; BARIUM OXIDES; BISMUTH OXIDES; CALCIUM OXIDES; COPPER IONS; COPPER OXIDES; ELECTRON BEAMS; ION BEAMS; MAGNETIC FLUX; STRONTIUM OXIDES; SUPERCONDUCTING FILMS; YTTRIUM OXIDES

15973 (JINR-D–14-94-269(v.1), pp. 151-152) **Formation of initial vortex structure in fine-grained HTSC.** Krasil'nikov, A.S. (AN SSSR, Moscow (Russian Federation). Inst. Khimicheskoj Fiziki); Mamsurova, L.G.; Trusevich, N.G.; Shcherbakova, L.G.; Pukhov, K.K. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15974 (JINR-D–14-94-269(v.1), pp. 155-156) **Kinetics of oxygen sublattice ordering in $TmBa_2Cu_3O_{6.6}$ at room temperature.** Kryukov, E.V. (Kazanskij Gosudarstvennyj Univ., Kazan (Russian Federation)); Barvin, O.M.; Semenova, E.A.; Teplov, M.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/order-disorder transformations; HIGH-TC SUPERCONDUCTORS/transition temperature; AGING; BARIUM OXIDES; COPPER OXIDES; DIFFUSION; OXYGEN; TEMPERATURE RANGE 0013-0065 K; THULIUM OXIDES; TIME DEPENDENCE

15975 (JINR-D–14-94-269(v.1), pp. 159-160) **Anisotropy of critical current of HTSC ceramics in magnetic field.** Kugel', K.I. (AN SSSR, Moscow (Russian Federation). Inst. Vysokikh Temperatur); Rakhmanov, A.L.; Mejlikhov, E.Z.; Matsushita, T. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/critical current; ANISOTROPY; BARIUM OXIDES; CERAMICS; COPPER OXIDES; MAGNETIC FIELDS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; YTTRIUM OXIDES

15976 (JINR-D–14-94-269(v.1), pp. 161-162) **Critical state of $Nd_{1.85}Ce_{0.15}CuO_{4-\delta}$ thin films in a cross field.** Kuznetsov, A.V. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Ivanov, A.A.; Sinchenko, A.A.; Churkin, O.A.; Eremenko, D.V.; Galkin, S.G.; Trofimov, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 4 figs. SUPERCONDUCTING FILMS/magnetic properties; CERIUM OXIDES; COPPER OXIDES; CRITICAL CURRENT; MAGNETIC FIELDS; MAGNETIC MOMENTS; NEODYMIUM OXIDES; ORIENTATION; TEMPERATURE RANGE 0013-0065 K; THIN FILMS

15977 (JINR-D–14-94-269(v.1), pp. 164-165) **Thermal boundary resistance of YBaCuO film on MgO and sapphire substrates.** Leonov, V.N.; Khrebtov, I.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. SUPERCONDUCTING FILMS/electric conductivity; SUPERCONDUCTING FILMS/interfaces; BARIUM OXIDES; COPPER OXIDES; MAGNESIUM OXIDES; SAPPHIRE; SUBSTRATES; INTERFACES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15978 (JINR-D–14-94-269(v.1), pp. 166-167) **Angular dependences of higher harmonics on mutual orientation of constant and alternating magnetic fields.** Luzyanin, I.D. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki); Khavronin, V.P.; Ginzburg, S.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/magnetic fields; HIGH-TC SUPERCONDUCTORS/penetration depth; BARIUM OXIDES; CERAMICS; COPPER OXIDES; HARMONICS; ORIENTATION; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE

RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15979 (JINR-D–14-94-269(v.1), pp. 168) **Ferroelectric microdomain of oxygen vacancy in $YBa_2Cu_3O_{7-\delta}$.** Lykakh, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/phase transformations; HIGH-TC SUPERCONDUCTORS/vacancies; CHARGE CARRIERS; DOMAIN STRUCTURE; VACANCIES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; TRANSITION TEMPERATURE

15980 (JINR-D–14-94-269(v.1), pp. 169-170) **Fluctuation effects and upper critical field in HTSC.** Mazov, L.S. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/critical field; BARIUM OXIDES; COPPER OXIDES; FLUCTUATIONS; MAGNETIZATION; SPIN WAVES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

15981 (JINR-D–14-94-269(v.1), pp. 177-178) **Variations of magnetic flux relation rate in Y-Ba-Cu-O film under crossed electric field effect.** Matizen, Eh.V. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Ishikaev, S.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 11 refs. SUPERCONDUCTING FILMS/crossed fields; SUPERCONDUCTING FILMS/magnetic flux; BARIUM OXIDES; COPPER OXIDES; ELECTRIC FIELDS; HIGH-TC SUPERCONDUCTORS; MAGNETIC MOMENTS; RELAXATION; TIME DEPENDENCE; YTTRIUM OXIDES

15982 (JINR-D–14-94-269(v.1), pp. 181-182) **Evolution of transport and magnetic properties of granular $YBa_2Cu_3O_{7-\delta}$ superconductors at a decrease of Josephson binding.** Mitin, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15983 (JINR-D–14-94-269(v.1), pp. 185-186) **Hall effect in the $Gd_{1-x}Pr_xBa_2Cu_3O_{7-y}$ system. Comparison with $Y_{1-x}Pr_xBa_2Cu_3O_{7-y}$.** Narozhnyj, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15984 (JINR-D–14-94-269(v.1), pp. 187-188) **Study of $REBa_2(Cu_{1-x}Me_x)_3O_{7-y}$ (RE=Y, Gd; M=Ni, Fe) systems in superconducting and normal states.** Alekseevskij, N.E. (AN SSSR, Moscow (Russian Federation). Inst. Fizicheskikh Problem); Narozhnyj, V.N.; Kochetkov, V.N.; Khlybov, E.P.; Warchulska, J. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15985 (JINR-D–14-94-269(v.1), pp. 191-192) **Specific heat of specimens of YBCO-system with rare earth substitutions in a normal state range.** Naumov, V.N. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Amitin, E.B.; Frolova, G.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15986 (JINR-D–14-94-269(v.1), pp. 193-194) **Fluctuation conductivity of $Bi_2Sr_2CaCu_2O_x$ and $Bi_{1.8}Pb_{0.2}Sr_2CaCu_2O_x$ HTSC.** Nejfel'd, Eh.A. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Demchuk, K.M.; Kharus, G.I.; Shtrapenin, G.L.; Bobylev, I.B.; Domanskaya, L.I.; Bubnova, A.Eh.; Ignatenkov, A.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15987 (JINR-D–14-94-269(v.1), pp. 201-202) **Paramagnetic Meisner effect in superconductors.** Obukhov, Yu.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In

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15988 (JINR-D–14-94-269(v.1), pp. 205) **Stability of structure and properties of $YBa_2Cu_3O_{70x}$ thin epitaxial films under conditions of open space and earth atmosphere.** Khrushch, B.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Palatnik, L.S.; Koz'ma, A.A.; Khromova, T.I.; Malykhin, S.V.; Stetsenko, A.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15989 (JINR-D–14-94-269(v.1), pp. 206-207) **Production and properties of large superconducting single crystals of $La_{2-x}Sr_xCuO_4$ and Nd_{2-}-xCe_xCuO_4.** Panova, G.Kh. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Khlopkin, M.N.; Chernoplekov, N.A.; Suetin, A.V.; Shikov, A.A.; Balashov, A.M.; Karaboshev, S.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15990 (JINR-D–14-94-269(v.1), pp. 208-209) **Giant magnetostriction in MTG specimens of YBaCuO superconducting state.** Chabanenko, V.V. (AN Ukrainskoj SSR, Donetsk (Ukraine). Fiziko-Tekhnicheskij Inst.); Pekhota, S.; Shimchak, G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15991 (JINR-D–14-94-269(v.1), pp. 210-211) **Synthesis, crystal structure and inelastic scattering of neutrons in $Sr_{1-x}Nd_xCuO_2$ infinite superconductors.** Podlesnyak, A.A. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Mirmel'shtejn, A.A.; Voronin, V.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15992 (JINR-D–14-94-269(v.1), pp. 212-213) **Magnetic shielding at liquid nitrogen temperatures.** Polushkin, V.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Buev, A.R.; Koch, H. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15993 (JINR-D–14-94-269(v.1), pp. 214-215) **Growth and structure of $Bi_2Sr_2CaCu_2O_{8-x}$ epitaxial films on $SrTiO_3$ substrates with CeO_2 and MgO buffer layers.** Polyakov, S.G. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Kov'ev, Eh.K.; Kupriyanov, M.Yu.; Pfuch, A.; Zach, K.; Siedel, P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15994 (JINR-D–14-94-269(v.1), pp. 218) **Superconductor-insulator transition induced by magnetic field in $Nd_{1.85}Ce_{0.15}CuO_4$ single crystal.** Ponomareva, A.I. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Krylov, K.R.; Charikova, T.B.; Leonyuk, L.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HIGH-TC SUPERCONDUCTORS/electric conductivity; HIGH-TC SUPERCONDUCTORS/phase transformations; CERIUM OXIDES; COPPER OXIDES; MAGNETIC FIELDS; MONOCRYSTALS; NEODYMIUM OXIDES

15995 (JINR-D–14-94-269(v.1), pp. 224-225) **Logarithmic relaxation of electric conductivity related to a glass state of oxygen subsystem in bismuth HTSC.** Romanenko, A.I. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30.*

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15996 (JINR-D–14-94-269(v.1), pp. 226-227) **T^2 dependence of electric conductivity in the range of 500 < T < 1000 K for bismuth HTSC being related to the mobility of oxygen subsystem.** Romanenko, A.I. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Ivannikova, N.V.; Kozeeva, L.P.; Naumov, N.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15997 (JINR-D–14-94-269(v.1), pp. 228-229) **Electric conductivity $t^{1/2}$ and $t^{1/4}$ relaxation in $YBa_2Cu_3O_{6+x}$ and $PrBa_2Cu_3O_{6+x}$ at various states of their oxygen subsystem.** Romanenko, A.I. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Zakharchuk, N.F.; Kozeeva, L.P.; Kupriyanov, I.N.; Samojlov, P.P.; Kravchenko, V.S.; Razlevinskij, O.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15998 (JINR-D–14-94-269(v.1), pp. 230) **Oxygen nonstoichiometry and dielectric properties of $YBa_2Cu_3O_{6+x}$.** Rudyj, A.S. (Yaroslavskij Gosudarstvennyj Univ., Yaroslavl (Russian Federation)); Rud', N.A.; Churilov, A.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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15999 (JINR-D–14-94-269(v.1), pp. 231) **Determination of bridge oxygen concentration in YBaCuO films.** Rumyantsev, V.V. (AN Ukrainskoj SSR, Donetsk (Ukraine). Fiziko-Tekhnicheskij Inst.). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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16000 (JINR-D–14-94-269(v.1), pp. 236) **Calorimetric and volt-ampere studies of $YBa_2Cu_3O_{6+\delta}$ behaviour in the temperature range of 300 to 420 K.** Semenova, Z.I. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Glazkov, S.Yu.; Stenin, Yu.G.; Zakharchuk, N.F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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16001 (JINR-D–14-94-269(v.1), pp. 239-240) **Autooscillations of normal zone in thin HTSC films with transport current.** Skokov, V.N.; Koverda, V.P.; Semenova, N.M.; Ivakin, V.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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16002 (JINR-D–14-94-269(v.1), pp. 242-243) **Surafce current relaxation in granulated HTSC.** Sotnikov, G.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Dabagyan, G.V.; Nikonov, A.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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16003 (JINR-D–14-94-269(v.1), pp. 246-247) **Narrow lines of complex magnetic susceptibility in the vicinity of a frozen field in submicron particles of $YBa_2Cu_3O_{6+x}$ produced according to zol-gel technology.** Stepanov, Yu.P. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Flejsher, V.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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16004 (JINR-D–14-94-269(v.1), pp. 248-249) **Difficult tetra-ortho transition and temperature dependence of the London penentration depth in submicron $YBa_2Cu_3O_{6+x}$ particles produced according to Zol-Gel technology.** Stepanov, Yu.P. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Flejsher, V.G.; Laiho, R.; Lahderanta, E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

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16005 (JINR-D–14-94-269(v.1), pp. 255-256) **Study of Cu-O structural fragments in HTSC and related phases.** Titova, S.G. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Balakirev, V.F.; Arbuzova, T.I.; Pal'-Val', P.P.; Pal'-Val', L.N.; Tolochko, S.P.; Kononyuk, I.F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. HIGH-TC SUPERCONDUCTORS/lattice parameters; HIGH-TC SUPERCONDUCTORS/phase studies; BARIUM OXIDES; COPPER OXIDES; INTERNAL FRICTION; MAGNETIC SUSCEPTIBILITY; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

16006 (JINR-D–14-94-269(v.1), pp. 257-258) **Phase diagram of oxygen ordering in $YBa_2Cu_3O_x$.** Titova, S.G. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Balakirev, V.F.; Sludnov, S.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 8 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/order-disorder transformations; HIGH-TC SUPERCONDUCTORS/phase diagrams; BARIUM OXIDES; CONCENTRATION RATIO; COPPER OXIDES; LATTICE PARAMETERS; OXYGEN; TRANSITION TEMPERATURE; YTTRIUM OXIDES

16007 (JINR-D–14-94-269(v.1), pp. 259-260) **Structural and bolometric properties of YBaCuO films on mica substrates.** Tkachenko, A.D. (Gosudarstvennyj Opticheskij Inst., Leningrad (Russian Federation)); Khrebtov, I.A.; Krayukhin, M.B.; Davydov, V.Yu.; Faleev, N.N.; Bajdakova, M.V.; Predtechenskij, M.R.; Smal', A.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. MICA/superconducting films; SUPERCONDUCTING FILMS/lattice parameters; SUPERCONDUCTING FILMS/vapor deposited coatings; BARIUM OXIDES; BOLOMETERS; COPPER OXIDES; HIGH-TC SUPERCONDUCTORS; MICA; SUBSTRATES; TEXTURE; YTTRIUM OXIDES

16008 (JINR-D–14-94-269(v.1), pp. 261-262) **Impedance of high temperature superconductors in the vicinity of transition temperature in frequency range of 200 to 1000 MHz.** Tulin, V.A.; Baginskij, K.V.; Berezin, V.A.; Govorkov, S.A.; Il'ichev, E.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/electric impedance; ANISOTROPY; ATTENUATION; BARIUM OXIDES; COPPER OXIDES; EPITAXY; FREQUENCY DEPENDENCE; MAGNETIC FIELDS; MHZ RANGE 100-1000; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; THIN FILMS; YTTRIUM OXIDES

16009 (JINR-D–14-94-269(v.1), pp. 267-268) **Optical properties of superconducting films of $YBa_2Cu_3O_{7-\delta}$, $Bi(Pb)Sr_2CaCu_2O_x$ and Te(Ba)CaCuO in visible and near infrared spectra.** Tyutyunnikov, S.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Shalyapin, V.N.; Balalykin, N.I.; Bukh, Yu.; Ehrgel', M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 1 fig. SUPERCONDUCTING FILMS/optical properties; BARIUM OXIDES; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; ELECTRONIC STRUCTURE; INFRARED SPECTRA; STRONTIUM OXIDES; TELLURIUM OXIDES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; VISIBLE SPECTRA; YTTRIUM OXIDES

16010 (JINR-D–14-94-269(v.1), pp. 269-270) **Order and disorder in oxygen-deficient planes of $YBa_2Cu_3O_{6+x}$ and their relations to normal and superconductive properties.** Ujmin, G.V. (AN SSSR, Moscow (Russian Federation). Inst. Teoretich-eskoj Fiziki). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HIGH-TC SUPERCONDUCTORS/charge carriers; HIGH-TC SUPERCONDUCTORS/crystal structure; BARIUM OXIDES; COPPER OXIDES; VALENCE; YTTRIUM OXIDES

16011 (JINR-D–14-94-269(v.1), pp. 271) **Nonstationary photoresponse of magnetic susceptibility of HTS Y-ceramics and Bi single crystals.** Fedorov, Yu.M. (AN SSSR, Krasnoyarsk (Russian Federation). Inst. Fiziki); Vorotynova, O.V.; Rudenko, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/magnetic susceptibility; HIGH-TC SUPERCONDUCTORS/optical pumping; BARIUM OXIDES; CERAMICS; COPPER OXIDES; EXCITATION; MAGNETIC FIELDS; MONOCRYSTALS; YTTRIUM OXIDES

16012 (JINR-D–14-94-269(v.1), pp. 272-273) **Superconducting film in a perpendicular (constant and alternative) magnetic fields: state calculation and determination of field dependence of critical current.** Fedorov, Yu.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Flejsher, V.G.; Semenchenko, M.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HIGH-TC SUPERCONDUCTORS/critical current; HIGH-TC SUPERCONDUCTORS/measuring methods; ANALYTICAL SOLUTION; BARIUM OXIDES; COPPER OXIDES; MAGNETIC FIELDS; ORIENTATION; SUPERCONDUCTING FILMS; YTTRIUM OXIDES

16013 (JINR-D–14-94-269(v.1), pp. 278-279) **Contribution of superconducting parameter fluctuations to thermoemf of HTSC.** Tszyan, Yu.N. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Shevchenko, O.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/thermoelectric properties; BARIUM OXIDES; COPPER OXIDES; CRYSTALS; FLUCTUATIONS; HOLMIUM OXIDES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K

16014 (JINR-D–14-94-269(v.1), pp. 280-282) **Photoconductivity in $La_2CuO_{4+\delta}$ at metamagnetic transition.** Tsygankov, A.K. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Teplov, A.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. COPPER OXIDES/photoconductivity; LANTHANUM OXIDES/photoconductivity; PHOTOCONDUCTIVITY; LASER RADIATION; MAGNETIC FIELDS; MAGNETORESISTANCE; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K

16015 (JINR-D–14-94-269(v.1), pp. 283-284) **Instability of magnetic flux in YBaCuO melt texture grown specimens.** Chabanenko, V.V. (AN Ukrainskoj SSR, Donetsk (Ukraine). Fiziko-Tekhnicheskij Inst.); Rojzenblat, E.M.; Ermolina, S.I.; Kisel', N.G.; Pekhota, S.; Shimchak, G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/instability; HIGH-TC SUPERCONDUCTORS/magnetic flux; ANISOTROPY; BARIUM OXIDES; COPPER OXIDES; INSTABILITY; MAGNETIC FIELDS; MAGNETIZATION; TEMPERATURE RANGE 0000-0013 K; YTTRIUM OXIDES

16016 (JINR-D–14-94-269(v.1), pp. 285-286) **Temperature and field dependences of internal friction and shear modulus of bismuth ceramics.** Chirkina, L.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Okovit, V.S.; Starodubov, Ya.D.; Lazareva, M.B.; Sergeeva, G.G.; Petrenko, V.T.; Tikhonovskij, M.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. SUPERCONDUCTORS/internal friction; SUPERCONDUCTORS/shear properties; BISMUTH OXIDES; CERAMICS; COBALT OXIDES; COPPER OXIDES; LEAD OXIDES; MAGNETIC FIELDS; STRONTIUM OXIDES; SUPERCONDUCTORS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16017 (JINR-D–14-94-269(v.1), pp. 291-292) **Specific features of tunneling in HTSC base structures.** Shukrinov, Yu.M. (AN Tadzhikskoj SSR, Dushanbe (Tajikistan). Fiziko-Tekhnicheskij Inst.). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 8 refs. HIGH-TC SUPERCONDUCTORS/electric conductivity; HIGH-TC SUPERCONDUCTORS/tunnel effect; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; MONOCRYSTALS; STRONTIUM OXIDES; TEMPERATURE RANGE 0000-0013 K

16018 (JINR-D–14-94-269(v.2)) **Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.** Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Report thesises of the conference on the low-temperature physics are presented. The fundamental problems of solids low-temperature physics, quantum liquids and crystals. Specific features are considered of structures, magnetic and thermodynamic properties of metals, alloys and other materials, and also optical and electric properties of thin films.

16019 (JINR-D–14-94-269(v.2), pp. 60-61) **Magnetic properties of dipole magnetic $CsGd(MoO_4)_2$ at low temperatures.** Anders, A.G. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Volotskij, S.V.; Startsev, S.V.; Feger, A.; Orendacheva, A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. CESIUM COMPOUNDS/magnetic susceptibility; GADOLINIUM COMPOUNDS/magnetic susceptibility; MOLYBDATES/magnetic susceptibility; CRYSTALS; CURIE-WEISS LAW; DIELECTRIC MATERIALS; MAGNETIC DIPOLES; MOLYBDATES; SPECIFIC HEAT; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K

16020 (JINR-D–14-94-269(v.2), pp. 66) **Elastic constants and magnetic susceptibility of monodomainized single crystals La_2CuO_{4+y}.** Barilo, S.N. (AN Belorusskoj SSR, Minsk (Belarus). Inst. Fiziki Tverdogo Tela i Poluprovodnikov); Zhigunov,

D.I.; Soshnikov, L.E.; Fil', V.D.; Panfilov, A.S.; Gajduk, A.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. LANTHANUM COMPOUNDS/elasticity; LANTHANUM COMPOUNDS/magnetic susceptibility; ANISOTROPY; CUPRATES; DOMAIN STRUCTURE; ELASTICITY; MONOCRYSTALS; PHASE TRANSFORMATIONS

16021 (JINR-D--14-94-269(v.2), pp. 74) **Measuring of antiferromagnetic susceptibility of Ho^{+3} ions in $HoFeO_3$ on SNIM-2 spectrometer.** Bujko, S.A.; Georgiev, D.; Nitts, V.V.; Krezhov, K.; Pasazhov, G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HOLMIUM OXIDES/antiferromagnetism; HOLMIUM OXIDES/magnetic susceptibility; ANTIFERROMAGNETISM; IRON OXIDES; MONOCRYSTALS; ORDER PARAMETERS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K

16022 (JINR-D--14-94-269(v.2), pp. 87-88) **Features of low temperature spin reorientation in dysprosium ortho-ferrite in H parallel b field.** Gnatchenko, S.L. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Petrovski, K.; Shimchak, R.; Shimchak, G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. DYSPROSIUM COMPOUNDS/phase diagrams; DYSPROSIUM COMPOUNDS/phase transformations; DOMAIN STRUCTURE; FERRITES; MAGNETIC PROPERTIES; OPTICAL PROPERTIES

16023 (JINR-D--14-94-269(v.2), pp. 92-93) **Localized and low measuring phonons in multilayer crystals.** Gospodarev, I.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Kosevich, A.M.; Syrkin, E.S.; Feodos'ev, S.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. YTTRIUM COMPOUNDS/lattice parameters; ANISOTROPY; BARIUM COMPOUNDS; CRYSTAL STRUCTURE; CUPRATES; INTERATOMIC FORCES; LAYERS; PHONONS; SPECTRA

16024 (JINR-D--14-94-269(v.2), pp. 106-107) **Electron-photon interactions in HTSC-like ceramics $LaSrAl_{1-x}Me_xO_4$ (Me = Ni^{3+}, Cu^{2+}).** Ivanova, T.A. (AN SSSR, Kazan (Russian Federation). Fiziko-Tekhnicheskij Inst.); Usachev, A.E.; Yablokov, Yu.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LANTHANUM COMPOUNDS/crystal defects; STRONTIUM COMPOUNDS/crystal defects; ALUMINIUM COMPOUNDS; CERAMICS; CUPRATES; ELECTRON SPIN RESONANCE; HIGH-TC SUPERCONDUCTORS; NICKELATES; SOLID SOLUTIONS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

16025 (JINR-D--14-94-269(v.2), pp. 116-117) **Magnetic frustration contribution into susceptibility of rare earth isostructural analogs of high-temperature superconductors.** Kovalev, A.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Bogdan, M.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EUROPIUM COMPOUNDS/magnetization; GADOLINIUM COMPOUNDS/magnetization; CUPRATES; MAGNETIZATION; FERROMAGNETISM; HIGH-TC SUPERCONDUCTORS; MAGNETIC FIELDS

16026 (JINR-D--14-94-269(v.2), pp. 129-130) **Structural phase transition in $KEr(MoO_4)_2$, induced by external magnetic field.** Kut'ko, V.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Kobets, M.I.; Pashchenko, V.A.; Stepanov, A.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. ERBIUM COMPOUNDS/phase transformations; MOLYBDATES/phase transformations; ABSORPTION SPECTRA; HYSTERESIS; MAGNETIC FIELDS; MOLYBDATES; MONOCRYSTALS; POTASSIUM COMPOUNDS; TEMPERATURE RANGE 0013-0065 K

16027 (JINR-D--14-94-269(v.2), pp. 157-158) **Orbital glass, induced by 2D spin fluctuation in antiferromagnetics with Jahn-Teller ions (Eu_2CuO_4 and $EuMn_2O_5$).** Sanina, V.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Babinskij, A.V.; Golovenchits, E.I.; Ginzburg, S.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961--: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. EUROPIUM COMPOUNDS/l-s coupling; EUROPIUM COMPOUNDS/magnetic susceptibility; CRYSTAL STRUCTURE; CUPRATES; DIELECTRIC PROPERTIES; JAHN-TELLER EFFECT; MAGNETIC FIELDS; MAGNETIZATION; OPTICAL PROPERTIES; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; TEMPERATURE RANGE 0400-1000 K

16028 (JINR-D--14-94-269(v.2), pp. 163-164) **Surface and internal magnetic solitons, induced by rare earth subsystem of ferrite garnets.** Sukstanskij, A.L. (Donetskij Fiziko-Tekhnicheskij Inst., Donetsk (Ukraine)); Tarasenko, S.V. Rossijskaya Akademiya

Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GADOLINIUM OXIDES/solitons; FERRITE GARNETS; SOLITONS; IRON OXIDES; MAGNETIC FIELDS; MAGNETIZATION; SPIN WAVES

16029 (JINR-D–14-94-269(v.2), pp. 170-171) **Magnetic phase transformations in chain Ising's antiferromagnetic $CrEr(MoO_4)_2$.** Khats'ko, E.N. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Chernyj, A.S.; Kobets, M.I.; Pashchenko, V.A.; Kaplienko, A.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 figs. ERBIUM COMPOUNDS/antiferromagnetic materials; ERBIUM COMPOUNDS/magnetic susceptibility; ERBIUM COMPOUNDS/phase transformations; MOLYBDATES/antiferromagnetic materials; MOLYBDATES/magnetic susceptibility; MOLYBDATES/phase transformations; CHROMIUM COMPOUNDS; CRYSTAL LATTICES; ELECTRON SPIN RESONANCE; LATTICE PARAMETERS; MAGNETIZATION; MOLYBDATES; SPECTRA; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

16030 (JINR-D–14-94-269(v.2), pp. 182-183) **Dynamics of lattice and f-electron excitations in SmB_6.** Alekseev, P.A.; Lazukov, V.N.; Sadikov, I.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 10 refs. SAMARIUM BORIDES/electronic structure; SAMARIUM BORIDES/l-s coupling; LATTICE PARAMETERS; MONOCRYSTALS; PHONONS; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K; VALENCE

16031 (JINR-D–14-94-269(v.2), pp. 184-185) **Magnetic properties of amorphous $PrNi_5$.** Alekseev, P.A.; Lazukov, V.N.; Orlov, V.G.; Sadikov, I.P.; Nizhankovskij, V.I.; Zuk, I.B.; Shmidt, Kh. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 2 figs. PRASEODYMIUM NITRIDES/amorphous state; PRASEODYMIUM NITRIDES/magnetization; HEAT TREATMENTS; MAGNETIZATION; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

16032 (JINR-D–14-94-269(v.2), pp. 210-211) **Temperature dependence of normal resistance of HTSC Josephson junction on bicrystal substate.** Vengrus, I.I. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Maresov, A.G.; Snigirev, O.V.; Devyatov, I.A.; Kupriyanov, M.Yu. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. STRONTIUM COMPOUNDS/electric conductivity; STRONTIUM COMPOUNDS/temperature dependence; YTTRIUM COMPOUNDS/electric conductivity; YTTRIUM COMPOUNDS/temperature dependence; BARIUM COMPOUNDS; CUPRATES; HIGH-TC SUPERCONDUCTORS; JOSEPHSON JUNCTIONS; SPRAYED COATINGS; SUBSTRATES; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; THIN FILMS; TITANATES

16033 (JINR-D–14-94-269(v.2), pp. 218-219) **Study of electron-phonon interaction duration in NbC films.** Gershenzon, E.M. (Moskovskij Gosudarstvennyj Pedagogicheskij Inst., Moscow (Russian Federation)); Il'in, K.S.; Karasik, B.S.; Ptitsina, N.G.; Krasnosvobodtsev, S.I.; Pechen', E.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. NIOBIUM CARBIDES/diffusion; NIOBIUM CARBIDES/electron-phonon coupling; ELECTRIC CONDUCTIVITY; DIFFUSION; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; THIN FILMS; TIME DEPENDENCE

16034 (JINR-D–14-94-269(v.2), pp. 224-225) **Hybridization contribution into crystal field in compounds $ReCu_2Si_2$ (Re - rare earths).** Goremychkin, E.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Muzychka, A.Yu.; Osborn, R. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig., 1 tab. ERBIUM SILICIDES/hybridization; PRASEODYMIUM SILICIDES/hybridization; ANTIFERROMAGNETIC MATERIALS; COPPER SILICIDES; CRYSTAL FIELD; CRYSTAL STRUCTURE; ELECTRON-ELECTRON INTERACTIONS; ELECTRONIC STRUCTURE; HYBRIDIZATION

16035 (JINR-D–14-94-269(v.2), pp. 238-239) **Effect of electric field on phonons kinetics in virtual ferroelectrics at low temperatures.** Kagan, V.D. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Suslov, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. STRONTIUM TITANATES/phonons; TANTALATES/phonons; CRYSTAL LATTICES; DIFFUSION; DOMAIN STRUCTURE; ELECTRIC FIELDS; FERROELECTRIC MATERIALS; KINETICS; POTASSIUM COMPOUNDS; SPECIFIC HEAT; PHONONS; TANTALATES; TEMPERATURE RANGE 0000-0013 K; THERMAL CONDUCTIVITY

16036 (JINR-D–14-94-269(v.2), pp. 279-280) **Features of electrical properties of Ln-Ba-Cu-O and Ln-Sr-Nb-O (Ln = La, Nd, Gd, Dy, Tm, Lu) systems near by transition metal-dielectric.** Mitin, A.V. (AN SSSR, Moscow (Russian Federation). Inst. Fizicheskikh Problem); Kuz'micheva, G.M.; Khlybov, E.P. Rossijskaya Akademiya Nauk. Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs., 2 figs. DYSPROSIUM COMPOUNDS/electric conductivity; LANTHANUM COMPOUNDS/electric conductivity; NIOBATES/electric conductivity; STRONTIUM COMPOUNDS/electric conductivity; BARIUM COMPOUNDS; COMPARATIVE EVALUATIONS; CUPRATES; NIOBATES; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

16037 (JINR-E–17-93-335, pp. 147) **BSCCO-2212 thin films and multilayer on $SrTiO_3$ substrates.** Pfuch, A.; Unzen, S.; Schnedewind, H.; Schmauder, T.; Zach, K.; Seidel, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/bismuth oxides; SUPERCONDUCTING FILMS/synthesis; CRITICAL CURRENT; CURRENT DENSITY; LAYERS; STRONTIUM TITANATES; SUBSTRATES; SYNTHESIS; THIN FILMS; TRANSITION TEMPERATURE

16038 (JINR-E–17-93-335, pp. 151) **On the phase transition between Bi-2201 oxides.** Cherginets, V.L.; Demirskaya, O.V.; Ishchuk, V.M.; Khailova, E.G.; Rebrova, T.P.; Seminozhenko, V.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. BISMUTH OXIDES/crystal-phase transformations; BISMUTH OXIDES/high-tc superconductors; CRITICAL CURRENT; CRYSTALS; TEMPERATURE DEPENDENCE; TEXTURE

16039 (JINR-E–17-93-335, pp. 165) **Structural phase transitions in $(La/Sn)_2CuO_4$ and their relation to superconductivity.** Braden, M. (and others); Schweiss, P.; Heger, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CUPRATES/superconductivity; LANTHANUM COMPOUNDS/crystal-phase transformations; LANTHANUM COMPOUNDS/superconductivity; STRONTIUM COMPOUNDS/crystal-phase transformations; STRONTIUM COMPOUNDS/superconductivity; CUPRATES; SUPERCONDUCTIVITY; MONOCRYSTALS

16040 (JINR-E–17-93-335, pp. 166) **Damages in Y-Ba-Cu-O films produced by ^4He ions.** Chernenko, L.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Kobzev, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/physical radiation effects; BARIUM COMPOUNDS/superconducting films; CUPRATES/physical radiation effects; CUPRATES/superconducting films; YTTRIUM COMPOUNDS/physical radiation effects; YTTRIUM COMPOUNDS/superconducting films; CRYSTAL DEFECTS; CUPRATES; HELIUM 4 BEAMS; MEV RANGE 01-10; MONOCRYSTALS

16041 (JINR-E–17-93-335, pp. 167) **Neutron investigation of single crystals of $LaCuO_4$ (Nd, Ce)$_2CuO_4$ and $BaBiO_3$-$KBiO_3$ system.** Balagurov, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Barilo, S.N.; Beskrovnyj, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH OXIDES/crystal structure; BISMUTH OXIDES/structural chemical analysis; CUPRATES/crystal structure; CUPRATES/structural chemical analysis; BARIUM OXIDES; CUPRATES; LANTHANUM COMPOUNDS; MONOCRYSTALS; NEODYMIUM COMPOUNDS; NEUTRON DIFFRACTION; ORDER PARAMETERS

16042 (JINR-E–17-93-335, pp. 168) **Microstructure investigations of melt-textured $YBa_2Cu_3O_x$.** Muller, D. (and others); Ulrich, M.; Heinemann, K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/stacking faults; CUPRATES/stacking faults; YTTRIUM COMPOUNDS/stacking faults; CRYSTAL GROWTH; CUPRATES; ELECTRON DIFFRACTION; ELECTRON MICROSCOPY; MELTING; MICROSTRUCTURE; TEXTURE

16043 (LA–12825-T) **Solution based temperature of Perovskite-type oxide films and powders.** McHale, J.M. Jr. (Temple Univ., Philadelphia, PA (United States). Dept. of Chemistry). Los Alamos National Lab., NM (United States). Apr 1995. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009089. Source: OSTI; NTIS; GPO Dep.

Conventional solid state reactions are diffusion limited processes that require high temperatures and long reaction times to reach completion. In this work, several solution based methods were utilized to circumvent this diffusion limited reaction and achieve product formation at lower temperatures. The solution methods studied all have the common goal of trapping the homogeneity inherent in a solution and transferring this homogeneity to the solid state, thereby creating a solid atomic mixture of reactants. These atomic mixtures can yield solid state products through "diffusionless" mechanisms. The effectiveness of atomic mixtures in solid state synthesis was tested on three classes of materials, varying in complexity. A procedure was invented for obtaining the highly water soluble salt, titanyl nitrate, $TiO(NO_3)_2$, in crystalline form, which allowed the production of titanate materials by freeze drying. The freeze drying procedures yielded phase pure, nanocrystalline $BaTiO_3$ and the complete SYNROC-B phase assemblage after ten minute heat treatments at 600°C and 1100°C, respectively. Two novel methods were developed for the solution based synthesis of $Ba_2YCu_3O_{7-x}$ and $Bi_2Sr_2Ca_2Cu_3O_{10}$. Thin and thick films of $Ba_2YCu_3O_{7-x}$ and $Bi_2Sr_2Ca_2Cu_3O_{10}$ were synthesized by an atmospheric pressure, chemical vapor deposition technique. Liquid ammonia solutions of metal nitrates were atomized with a stream of N_2O and ignited with a hydrogen/oxygen torch. The resulting flame was used to coat a substrate with superconducting material.

Bulk powders of $Ba_2YCu_3O_{7-x}$ and $Bi_2Sr_2Ca_2Cu_3O_{10}$ were synthesized through a novel acetate glass method. The materials prepared were characterized by XRD, TEM, SEM, TGA, DTA, magnetic susceptibility and electrical resistivity measurements.

16044 (LA-UR–95-972) **A valence-fluctuation mechanism with highly anisotropic S-wave pairing.** Brandow, B.H. Los Alamos National Lab., NM (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950356–1: Stanford conference on spectroscopies in novel superconductors, Stanford, CA (United States), 15-18 Mar 1995). Order Number DE95009419. Source: OSTI; NTIS; GPO Dep.

The author has developed a fairly ab initio theory of cuprate superconductivity, based on the concept that the above-T_c state is a normal Fermi liquid with strong electronic correlations of the type found in valence-fluctuation (VF) and heavy-fermion materials. The ground-state-correlation aspect is found to provide a satisfactory source or mechanism for the pairing. In addition to the high T_c's this explains many of the unusual features of cuprate superconductivity.

16045 Method for plating with metal oxides. Silver, G.L.; Martin, F.S. To Dept. of Energy. 1993. Filed date 5 Mar 1993. U.S. Patent Application 8-026,643. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00053. Order Number DE95009975. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A method of plating hydrous metal oxides on at least one substrate, which method is indifferent to the electrochemical properties of the substrate, and comprises reacting metallic ions in aqueous solution with an appropriate oxidizing agent such as sodium hypochlorite or calcium oulfite with oxygen under suitable conditions of pH and concentration such that oxidation and precipitation of metal oxide are sufficiently slow to allow satisfactory plating of metal oxide on the substrate.

16046 (SAND–94-2869C) **Shock properties of high-strength ceramics.** Grady, D.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950788–5: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95007731. Source: OSTI; NTIS; GPO Dep.

A broad class of brittle solids subjected to large amplitude shock waves can support substantial shear stress (of order 2-10 GPa) without failing due to the very limited slip systems in these materials. When failure occurs under sufficiently intense shock loading, the effect is usually observed as a wave splitting in the compressive shock front. Because of the high confining stress state associated with the failure event in the shock compression environment, it is no longer certain whether the microstructural processes of deformation are brittle or ductile. Some, although by no means sufficient, evidence supports a brittle deformation mechanism in the materials of interest. The present short paper focuses on two aspects of the transition regime neighboring the HEL in the compressive shock process. First, issues of rate dependence associated with prompt yield under shock compression are not well understood. We report here on observations of wave profile data on ceramics, examining he issue of elastic precursor decay. Also in this study, a number of the experimental observations of failure waves in ceramic materials (principally glass) are surveyed. Some of the principal results are summarized and dynamic failure mechanisms consistent with these results are discussed.

16047 (SAND–95-0322C) **Synthesis of novel precursors for PMN powders and the thin films obtained from them.** Boyle, T.J.; Dimos, D.B.; Moore, G.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503115–1: International symposium on advanced synthesis and processing, College Station, TX (United States), 11-15 Mar 1995). Order Number DE95008543. Source: OSTI; NTIS; GPO Dep.

Sol-gel processing has been widely used in the preparation of lead zirconate titanate (PZT) thin films. The authors have applied this methodology to the formation of lead magnesium niobate (PMN) spin-cast deposited thin films. Since there is a limited number of soluble, commercially available compounds, the authors have recently synthesized a series of novel metal alkoxides for use as precursors for generation of PMN thin films and powders. The process for generation of the perovskite phase of these PMN powders and films are reported.

16048 (SAND–95-0567C) **Mechanism(s) for the suppression of the switchable polarization in PZT and $BaTiO_3$.** Warren, W.L. (Sandia National Labs., Albuquerque, NM (United States)); Dimos, D.; Tuttle, B.A.; Pike, G.E.; Raymond, M.V.; Nasby, R.D.; Ramesh, R.; Evans, J.T. Jr. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941144–121: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95009589. Source: OSTI; NTIS; GPO Dep.

Switchable polarization can be significantly suppressed in ferroelectric (FE) materials by optical, thermal, and electrical processes. The thermal process can occur by either annealing the FE in a reducing environment or by heating it in air to 100 C while impressing a bias near the switching threshold. The optical process occurs while biasing the FE near the switching threshold and illuminating with bandgap light. And the electrical suppression effect occurs by subjecting the FE to repeated polarization reversals. Using electron paramagnetic resonance, polarization-voltage measurements, and charge injection scenarios, the authors have been able to elucidate both electronic and ionic trapping effects that lead to a suppression in the amount of switchable polarization in FE materials. The relative roles of electronic and ionic effects in the same material can depend on the stress condition. For instance, in oxidized BaTiO3 crystals, optical and thermal suppressions occur by electronic domain pinning; electrical fatigue in the $BaTiO_3$ crystals also appears to involve electronic charge trapping, however, it is suggested that these electronic traps are further stabilized by nearby ionic defects. In sol-gel PZT thin films with either Pt, RuO_2, or La-Sr-Co-O electrodes it appears that the polarization suppression induced by electrical fatigue, a temperature/bias combination, or a light/bias combination are all primarily due to the trapping of electronic charge carriers to first order.

16049 (SAND–95-0735C) **The pyrochlore-to-perovskite transformation in solution-derived lead zirconate titanate thin films.** Voigt, J.A.; Tuttle, B.A.; Headley, T.J.; Lamppa, D.L. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941267–1: 4. Material Research Society-Ferroelectric thin films conference, Boston, MA (United States), 5-9 Dec 1994). Order Number DE95010453. Source: OSTI; NTIS; GPO Dep.

The authors have characterized the pyrochlore-to-perovskite crystallization process in solution-derived $Pb(Zr_{0.20}Ti_{0.80})O_3$ thin films on (100) MgO single crystal substrates. It has been determined that the perovskite phase nucleated preferentially at the film/MgO interface out of a nanocrystalline (≈100Å grains) pyrochlore matrix. During the early stages of the pyrochlore-to-perovskite conversion process, perovskite growth proceeded nearly isotropically from the substrate to form hemispherically shaped grains. Deviations from isotropic growth were shown to result from a growth dependence based on the crystallographic orientation of a growing perovskite grain relative to the orientations of pyrochlore grains being transformed. The volume change that occurs during the pyrochlore-to-perovskite transformation along with two-dimensional grain growth has been used to develop a mechanism for formation of porosity that commonly is concentrated in grain boundary regions.

16050 (Y/DV–1356) **Development of ceramic-coated weld backing bars.** Eggleston, B.R. Oak Ridge National Lab., TN (United States). 20 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009313. Source: OSTI; NTIS; GPO Dep.

In shipbuilding and many other industries, copper weld backing bars are used to draw the heat out of the weld. The problem that some users of these bars encounter is that these bars, on occasion, actually melt in spots and become welded to the weld plates. After

this happens a number of times, the backing bar becomes so degraded that it must be either discarded or machined, both of which are very costly and time-consuming actions. To avoid this fusion between the backing bar and the weld plate, the weld processes that are used cannot be ones of high beat input. This requirement is very limiting when thick plates are being welded. The plates must be beveled, and more weld passes must be run. These problems are also costly and time consuming. The aim of this project is to find a way to produce backing bars with nearly the same 'chilling' effect but with both a greater resistance to molten metal and resistance to arcing to the backing bar itself. A possible solution currently being tested is to coat the copper bars with a thin layer of a ceramic coating. The procedure used was to coat the copper bars with either alumina or spinel by a plasma spraying method.

16051 (Y/DW–1352) **Nondestructive testing of ceramic components: Cooperative research and development agreement completion report.** Carpenter, D.A.; Dews, T.W.; Moyer, M.W.; Oakes, R.E. Oak Ridge National Lab., TN (United States). 22 Dec 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009510. Source: OSTI; NTIS; INIS; GPO Dep.

In a joint Cooperative Research and Development Agreement (CRADA) between Martin Marietta Energy Systems (MMES) and an industrial partner, Y-12 has been evaluating nondestructive evaluation (NDE) techniques to identify the quality of high strength aluminum oxide tubes used in laser applications. In Phase I, several NDE techniques were developed to inspect the tubes. In Phase II a correlation between detected defects, actual failure mode and strength of the tubes was developed. In Phase II the industrial partner supplied tubes manufactured under a variety of conditions and containing material defects expected from process control variations. The tubes were inspected at MMES utilizing a variety of available acoustic techniques. After inspection, ring tensile specimens were fabricated to determine the tensile strength. The data were evaluated utilizing Weibull statistics to determine the statistical impact of the defects upon strength and correlate the data with the nondestructive evaluations of the tubes and observed defect distribution.

3606 Other Materials

Refer also to citation(s) 14750, 14907, 15027, 15030, 15053, 15054, 15292, 15293, 15294, 15295, 15297, 15357, 15362, 15726, 15744, 15796, 15799, 15903, 15914, 16124, 16272, 16278, 16297, 16333, 16445, 17232, 17234

16052 (ANL/ET/CP–83786) **Influence of fiber content on mechanical performance of SiC-fiber-reinforced reaction-bonded silicon nitride composites.** Singh, D. (Argonne National Lab., IL (United States). Energy Technology Div.); Singh, J.P.; Bhatt, R.T. Argonne National Lab., IL (United States). Jan 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950129–5: 19. annual conference on advanced ceramics, materials and structures, Cocoa Beach, FL (United States), 9-12 Jan 1995). Order Number DE95009903. Source: OSTI; NTIS; GPO Dep.

The effect of fiber content on the resulting mechanical properties (first matrix cracking stress, ultimate strength, and work-of-fracture) of silicon carbide (SiC)-fiber-reinforced reaction-bonded silicon nitride (RBSN) matrix composites was investigated. Flexure tests were used to evaluate mechanical properties of composites containing various fiber contents. The first matrix cracking stress, ultimate strength, and work-of-fracture of the composites increased with increasing fiber content, reaching a peak value at a fiber content of $\sim$ 16 vol.%. Further increases in fiber content degraded the mechanical properties of the composites. The variations in mechanical properties with fiber contents were correlated to the residual stresses in the matrix phase, processing related flaws, and failure modes observed in these composites.

16053 (ANL/MSD/PP–80065) **First-principles calculations of surface energy and electronic structure of LIF, NaCl and MgO (100) surfaces.** Guo, J. (Argonne National Lab., IL (United States). Materials Science Div.). Argonne National Lab., IL (United States). Jun 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005832. Source: OSTI; NTIS; GPO Dep.

Surface energy and electronic structure of LiF, NaCl and MgO (100) surfaces were calculated using the self-consistent-field Discrete Variational (DV) embedded cluster method in the local density approximation (LDA). Clusters of 100–164 atoms embedded in the semi-infinite host lattices were used to achieve the desired convergence. The (100) surface energies of 0.75J/m^2, 0.47J/m^2 and 1.53J/m^2 calculated for LiF, NaCl, and MgO, respectively, were compared with experimental data and other theoretical values. The surface atoms of LiF and NaCl were found to maintain their bulk ionic characters. The effective charges of MgO surface atoms were found to differ from the bulk atoms. The surface charge density contours were plotted and their corrugation amplitudes were compared with the He-atom diffraction results. The surface partial density of states were compared with optical, photoemission, and electron energy loss spectroscopic results.

16054 (AUC-IBT-R–9413) **Dense low-cement binders with microsilica and fly ash. Structure and properties.** Dalsgaard Holland, A. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik; Aalborg Portland (Denmark). Cement- og Betonlaboratoriet; Akademiet for de Tekniske Videnskaber, Lyngby (Denmark). May 1994. 323p. (In Danish). (CBL–52). Order Number DE95772416. Source: OSTI; NTIS.

The industrial researcher project has comprised investigations of structure and properties of very dense binders containing fly ash and microsilica and low contents of cement - LCD-binders. The LCD-binders based on the Densit-concept, which was developed at Aalborg Portland A/S. The designation 'LCD' refers to low cement Densit because of the parallel til the Densit-binders. The Densit-concept is based on binders consisting of densely packed cement particles having an average size of approx. 10 μm and 20-30 vol-% ultra fine particles having average size of approx. 0,1 μm, e.g. microsilica, placed between the densely packed cement particles. Using the Densit-concept, i.a. strengths 2-5 times those of conventional concrete have been reached. The fine particles can be chosen to provide specific properties of the binders, e.g. high wear resistance or specific magnetic properties. Also undersirable properties, such as heat development and hydration shrinkage, caused by the cement, can be reduced by substituting a part of the cement by non-reactive/less reactive materials such as for instance fly ash. Mechanical properties like strength and elasticity remain almost unchanged at a substitution of as much as 75 vol-% of the cement. The higher strengths imply the prospect of making more elegant, larger and slimmer constructions, resulting in less materials consumption. In the project the fine particles, besides cement, are fly ash only. A large spectrum of LCD-binders in regard to particle composition has been investigated. Binders with contents of microcilica varying between 0 and 30 vol-% of the binder particles, and binders with contents of cement varying between 1,5 and 100 vol-% of the fine particles, i.e. cement + fly ash, have been investigated, (EG) (49 refs.)

16055 (AUC-IBT-R–9413(app.)) **Dense low-cement binders with microsilica and fly ash. Structure and properties. Appendix.** Dalsgaard Holland, A. Aalborg Universitetscenter (Denmark). Inst. for Bygningsteknik; Aalborg Portland (Denmark). Cement- og Betonlaboratoriet; Akademiet for de Tekniske Videnskaber, Lyngby (Denmark). May 1994. 85p. (In Danish). (CBL–52(app.)). Order Number DE95772420. Source: OSTI; NTIS.

The industrial researcher project has comprised investigations of structure and properties of very dense binders containing fly ash and microsilica and low contents of cement - LCD-binder. The LCD-binders based on the Densit-concept, which was developed at Aalborg Portland A/S. The designation 'LCD' refers to low cement Densit because of the parallel to the Densit-binders. The Densit-concept is based on binders consisting of densely packed cement particles having an average size of approx. 10 μm and 20-30 vol-% ultra fine particles having average size of approx. 0,1 μm, e.g. microsilica, placed between the densely packed cement particles. Using the Densit-concept, i.a. strengths 2-5 times those of conventional concrete have been reached. The fine particles can be chosen to provide specific properties of the binders, e.g. high wear

resistance or specific magnetic properties. Also undesirable properties, such as heat development and hydration shrinkage, caused by the cement, can be reduced by substituting a part of the cement by non-reactive/less reactive materials such as for instance fly ash. Mechanical properties like strength and elasticity remain almost unchanged at a substitution of as much as 75 vo.-% of the cement. The higher strengths imply the prospect of making more elegant, larger and slimmer constructions, resulting in less materials consumption. In the project the fine particles, besides cement, are fly ash only. A large spectrum of LCD-binders in regard to particle composition has been investigated. Binders with contents of microcilica varying between 0 and 30 vol-% of the binder particles, and binders with contents of cement varying between 1,5 and 100 vol-% of the fine particles, i.e. cement + fly ash, have been investigated. (EG)

16056 (BNL–61149, pp. 333-334) **Radiation effects on polymers.** Link, J. (Univ. of Washington, Seattle, WA (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

There has been a lot of speculation on radiation sensitivity of materials. Some of the comments about materials problems due to radiation sensitivity made no sense given the radiation fields and time for which these materials were exposed to those radiation fields. Radiation sensitivity of polymeric materials has been studied. Publications considered are from CERN-European Organization for Nuclear Research.

16057 (CONF-941144–104) **Fabrication and modification of metal nanocluster composites using ion and laser beams.** Haglund, R.F. Jr. (Vanderbilt Univ., Nashville, TN (United States)); Osborne, D.H. Jr.; Magruder, R.H. III; White, C.W.; Zuhr, R.A.; Townsend, P.D.; Hole, D.E.; Leuchtner, R.E. Oak Ridge National Lab., TN (United States). Dec 1994. 12p. Sponsored by USDOE, Washington, DC (United States);Science and Engineering Research Council, Swindon (United Kingdom);North Atlantic Treaty Organization, Brussels (Belgium);Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Contract DAAH04-93-G-0123. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009131. Source: OSTI; NTIS; INIS; GPO Dep.

Metal nanocluster composites have attractive properties for applications in nonlinear optics. However, traditional fabrication techniques – using melt-glass substrates – are severely constrained by equilibrium thermodynamics and kinetics. This paper describes the fabrication of metal nanoclusters in both crystalline and glassy hosts by ion implantation and pulsed laser deposition. The size and size distribution of the metal nanoclusters can be modified by controlling substrate temperature during implantation, by subsequent thermal annealing, or by laser irradiation. The authors have characterized the optical response of the composites by absorption and third-order nonlinear-optical spectroscopies; electron and scanning-probe microscopies have been used to benchmark the physical characteristics of the composites. The outlook for controlling the structure and nonlinear optical response properties of these nanophase materials appears increasingly promising.

16058 (CONF-941144–105) **Amorphization threshold in Si-implanted strained SiGe alloy layers.** Simpson, T.W. (Univ. of Western Ontario, London, Ontario (Canada). Dept. of Physics); Love, D.; Endisch, E.; Goldberg, R.D.; Mitchell, I.V.; Haynes, T.E.; Baribeau, J.M. Oak Ridge National Lab., TN (United States). Dec 1994. 7p. Sponsored by USDOE, Washington, DC (United States);Ontario Centre for Materials Research, Kingston, ON (Canada). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95008901. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have examined the damage produced by Si-ion implantation into strained $Si_{1-x}Ge_x$ epilayers. Damage accumulation in the implanted layers was monitored in situ by time-resolved reflectivity and measured by ion channeling techniques to determine the amorphization threshold in strained $Si_{1-x}Ge_x$ (x = 0.16 and 0.29) over the temperature range 30–110 C. The results are compared with previously reported measurements on unstrained $Si_{1-x}Ge_x$, and with the simple model used to describe those results. They report here data which lend support to this model and which indicate that pre-existing strain does not enhance damage accumulation in the alloy layer.

16059 (CONF-941144–115) **Interface degradation in CAS/Nicalon during elevated temperature aging.** Plucknett, K.P. (Oak Ridge National Lab., TN (United States)); Cain, R.L.; Lewis, M.H. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States);European Economic Community, Brussels (Belgium). DOE Contract AC05-84OR21400. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95008843. Source: OSTI; NTIS; GPO Dep.

A $CaO-Al_2O_3-SiO_2$ (CAS)/Nicalon glass-ceramic matrix composite has been subjected to elevated temperature oxidation heat-treatments between 375 and 1200°C, for up to 100 hours. Micro- and macro-mechanical properties have been determined by fiber push-down, using a mechanical properties microprobe, and flexure testing, respectively. Aging between 450 and 800°C results in significant property degradation, with reduced bending modulus and flexure strength, increased fiber sliding stress, and a transition to a purely brittle failure mode. Aging degradation is due to oxidative removal of the carbon interlayer, with the subsequent formation of a silica bond between fiber and matrix. At higher temperatures, carbon is retained due to the formation of a protective silica plug at exposed fiber ends, with the subsequent retention of composite properties. Short duration pre-treatment schedules, at 1000 or 1100°C, were developed to prevent intermediate temperature property degradation.

16060 (CONF-941144–119) **Suppression of self-interstitials in silicon during ion implantation via in-situ photoexcitation.** Ravi, J. (North Carolina State Univ., Raleigh, NC (United States). Dept. of Materials Science and Engineering); Erokhin, Yu.; Christensen, K.; Rozgonyi, G.A.; Patnaik, B.K.; White, C.W. Oak Ridge National Lab., TN (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC05-84OR21400. Grant DMR-9215538. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95009173. Source: OSTI; NTIS; INIS; GPO Dep.

The influence of in-situ photoexcitation during low temperature implantation on self-interstitial agglomeration following annealing has been investigated using transmission electron microscopy (TEM). A reduction in the level of as-implanted damage determined by RBS and TEM occurs athermally during 150 keV self-ion implantation. The damage reduction following a 300 C anneal suggests that it is mostly divacancy related. Subsequent thermal annealing at 800 C resulted in the formation of (311) rod like defects or dislocation loops for samples with and without in-situ photoexcitation, respectively. Estimation of the number of self-interstitials bound by these defects in the sample without in-situ photoexcitation corresponds to the implanted dose; whereas for the in-situ photoexcitation sample a suppression of ≈2 orders in magnitude is found. The kinetics of the athermal annealing process are discussed within the framework of either a recombination enhanced defect reaction mechanism, or a charge state enhanced defect migration and Coulomb interaction.

16061 (CONF-950129–3) **Differences in creep performance of a HIPed silicon nitride in ambient air and inert environments.** Wereszczak, A.A.; Kirkland, T.P.; Ferber, M.K. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 19. annual conference on advanced ceramics, materials and structures; Cocoa Beach, FL (United States); 9-12 Jan 1995. Order Number DE95009172. Source: OSTI; NTIS; GPO Dep.

High temperature tensile creep studies of a commercially available hot isostatically pressed (HIPed) silicon nitride were

conducted in ambient air and argon environments. The creep performance of this HIPed silicon nitride was found to be different in these environments. The material crept faster (and had a consequential shorter lifetime) in argon than in ambient air at 1370°C at tensile stresses between 110-140 MPa. The stress dependence of the minimum creep rate was found to be ≈ 6 in argon and ≈ 3.5 in air, while the minimum creep rates were almost an order of magnitude faster in argon than in air at equivalent tensile stresses. Differences in the creep performance are explained with reference to the presence or absence of oxygen in the two environments.

16062 (CTH-PUBL–93-8, pp. 34-39) **Influence of heat and moisture on PUR-insulations.** Rautiainen, L. (Technical Research Centre of Finland (Finland)). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The environmental stresses affecting thermal insulation boards in buildings are temperature (high and low) temperature variations, moisture (depends on the type of the constructions) and also small loads (e.g. snow load on roofs). The temperature rise and decrease cause thermal movements the magnitude of which is relatively well known. The high temperatures due to solar radiation are above +70 degrees C only limited times during the year. These high temperatures can fasten the cell gas diffusion to some extent but clear aging as hardening in the PUR matrix itself has not been found. The influence of moisture on thermal insulation has been most often taken account as an increase of thermal conductivity which is also relatively well known. Compared to the knowledge of influence of temperature or moisture on insulation, less attention has been directed to the combined effect of heat and moisture on insulation. As an example the behaviour of different PUR-formulations with different history will be presented. The tests were performed at the temperatures +40-+60 degrees C, part of pieces in the water bath and part at RH 90% or higher. The common behaviour seemed to be increased water absorption and increased dimensional changes (swelling and/or shrinkage) with increasing moisture-temperature stresses. Concerning some formulations it seems that in the constructions in which the presence of simultaneous heat and moisture stresses are probable the dimensional changes may arise problems. 7 tabs

16063 (CTH-PUBL–93-8, pp. 40-46) **CFC in used and new polyurethane foams.** Ramnaes, O. (Chalmers Univ. of Technology, Goeteborg (Sweden). Dept. of Chemical Environmental Science); Svanstroem, M. Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The amount of CFC 11 in the polyurethane of used district heating pipes was determined. A special sampling device and a subsequent gas chromatographic analysis was used for the quantitative determination of CFC 11 in the gas phase. The total amount of CFC 11 in the foam and the amount of CFC 11 dissolved in the polymer matrix was determined by measuring reduction in weight. The heating pipes had been used for 1-20 years. For comparison, the amounts of CFC 11 in new district heating pipes were determined. Some newly manufactured pipes were analysed for their content of CFC 11, to make sure that certain specifications were followed. 8 refs, 3 tabs

16064 (CTH-PUBL–93-8, pp. 48-58) **The thermal conductivity of rigid PUR foam as a function of time.** Jarfelt, U. (Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. Project NUTEK-656-101. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The change in thermal conductivity as a function of time for rigid polyurethane foam made with different blowing agents has been studied in this project which is the first in a series of tests on different blowing agents and material properties. The first report sets out the results relating to the composition of the cell gases over a period of 100 days in slabs of polyurethane of different densities, made with different blowing agents, CO_2, CFC 11, HCFC 141b, HFC 134a, HFC 152a, n-pentane and c-pentane. The test specimens were made in a high pressure machine, and the same mix compositions were used as far as possible. The polyol and isocyanate were not varied between the test materials. Differences in density were brought about by different degrees of overpacking. The thermal conductivity of slabs of 30 mm thickness was studied in a plate apparatus over a period of 100 days. Parallel with this determination, gas analyses were made on cell gas contained in the polyurethane material. On the basis of the partial pressure obtained, the diffusion coefficient for the blowing agent, oxygen and nitrogen was determined. 6 refs, 8 figs, 1 tab

16065 (CTH-PUBL–93-8, pp. 59-65) **A symmetrical sample arrangement for accurate creep measurements on rigid PUR foams at elevated temperatures.** Bergstroem, G. (Swedish National Testing and Research Institute, Goeteborg (Sweden). Dept. of Materials and Mechanics); Karlsson, J. Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

A symmetrical sample arrangement has been used to facilitate accurate measurement of the creep behaviour of closed cell PUR foams at elevated temperatures. Partly modelling the actual PUR foam boundary conditions in a district heating pipe, the symmetry of the measurement set-up balances dimensional changes caused by thermal expansion of the PUR structure and by changes in cell gas pressure. The rise in temperature causes the gas pressure in the closed cells to increase, and at the same time the changes in gas pressure accelerate due to higher gas diffusion rates. By applying the mechanical load on a symmetry plane, the zero point for creep measurement is stabilised by a factor of 10, and creep deformation can be measured virtually independently of changes in internal pressure. The measuring procedure produces elevated temperature data which do not suffer from the ambiguity of conventional TMA measurements. The creep properties of different PUR foam materials can therefore be compared directly irrespective of gas types etc. The measuring set-up described was successfully used in two reference PUR foams, FEBIS I (CFC blown) and FEBIS II (CO_2 blown). At a load of 50 kPa, the creep behaviour has been studied in the temperature range 23 degrees C to 170 degrees C over loading periods of to 2000 hours. 3 refs, 14 figs

16066 (CTH-PUBL–93-8, pp. 66-74) **HFA 134a and alkane blown PUR-foam. Two ODP-zero solutions for the refrigeration industry.** Klausen, K.H. (Tectrade A/S, Naerum (Denmark)). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The increasing demand for replacement of ozone depletion gases and even greenhouse creating gases has led to the development of various chlorine and halogen free PUR-foam systems. This paper will describe two different solutions which are developed specifically for the refrigeration industry. 4 figs, 1 tab

16067 (CTH-PUBL–93-8, pp. 93-95) **Simple methods of description and determination of thermal conductivity of cellular plastics.** Kuelerich, O. (Danish Technological Institute, Aarhus (Germany). Dept. of Plastic Technology). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

Short communication PLASTICS/thermal conductivity; PLASTICS; BENCH-SCALE EXPERIMENTS; POLYURETHANES; PLASTIC FOAMS; MATERIALS TESTING

16068 (CTH-PUBL–93-8, pp. 96-105) **Quality documentation of foam density using non-destructive testing methods based on isotope techniques.** Fink, J. (FORCE Institutes, Broendby (Germany)); Teller, S.; Sevel, T. Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

Foam density is a key parameter in quality control of foam insulation products like polyurethane based refrigerators, freezing boxes, sandwich elements and constructions, and preinsulated district heating pipes. Production characteristics in the foaming process will affect the bulk density and the homogeneity of the foam. Voids may be created, etc. Over the years, this has created a need for non-destructive testing and quality documentation methods for regular control. The introduction of new foaming processes like the CFC-free approaches highlights this need for the manufacturer to be able to document that the quality of the new, environmentally friendly product is not deteriorated compared to the traditionally produced products already known by the consumer. Gamma-rays have shown to be well suited as a physical measuring principle for foam density measurements. A number of different instrumentations have been developed based on detection either of transmitted radiation or reflected radiation (access only required from one side). The instrumentations have proved to be both versatile and reliable tools for non-destructive quality documentation. New technology involving gamma radiation of different energies has recently been applied for complicated structures. X-ray methods have also been applied and new applications based on digital radiation detection are emerging. 3 refs, 6 figs

16069 (CTH-PUBL–93-8, pp. 108-119) **Towards more environmentally friendly rigid polyurethane foams.** Thijs, S. (Shell Research SA, Ottignies-Louvain-la-Neuve (Belgium). Chemical Research Centre). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

Shell's approach to phase out CFCs in rigid polyurethane foams will be presented in this paper. Major progress has been achieved in the application areas of pipe insulation and continuous lamination. The approach, however, is quite different in the two applications because of the different requirements for processing and final product performance. In pipe insulation, several routes to replace CFCs have been considered. The introduction of alternative blowing agents has required the development of new polyols to overcome problems encountered in processing and end properties as a result of increased water levels in the formulations. These polyols have been developed after a thorough investigation of the influence of network parameters on the end properties of the polyurethane foam. In continuous lamination pentane technology is being implemented. Industrial scale trials have proven that pentane blown foam can be produced under safe working conditions. The processing performance and the foam physical properties are similar to CFC-11 blown foams. In both applications, the replacement of CFCs will reduce the insulation properties of the foam product. However, the increase of the initial and aged thermal conductivity remains at an acceptable level. Therefore, when choosing a CFC alternative, a balance has to be found between the environmental impact of the substitute and the final product performance. 5 refs, 5 figs, 3 tabs

16070 (CTH-PUBL–93-8, pp. 120-128) **Conditioning method for cellular plastics. Verification of the 'Nordtest method'.** Isberg, J. (Chalmers Univ. of Technology, Goeteborg (Sweden). Building Technology). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The tests carried out show that the values of thermal conductivity measured at different times and on different thicknesses of one and the same material are situated on the same curve when the thermal conductivity is plotted as a function of time/(thickness)^2. It is therefore possible to subject materials to accelerated ageing by reducing their thickness. 3 refs, 4 figs

16071 (CTH-PUBL–93-8, pp. 129-136) **Quantitative determination of gaseous components in cellular plastics.** Kokko, E. (Technical Research Centre of Finland (Finland). Lab. of Heating and Ventilation). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The aging of cellular plastics based on different blowing agents is because of many reasons of current interest. Both modelling of aging processes and development of different solution methods have created a need for direct measurement methods for different model parameters and for the aging behaviour of cellular plastics systems. The method described in this presentation is of latter type. Anyhow this method offers a possibility to determine values of model parameters by using a parameter identification technique too. In this case a competent aging model is needed. The method is very useful in determining the local values of total pressure in different foam systems. Because of great pressure differences in foams, the typical change in pressure level in crushing chamber can be 0-4 kPa without any problem to be measurable. Experiences of quantitative determination of partial gases are still few. It seems to be better to have an online connection from crushing chamber to GC-apparatus. Determination of the effective volume of samples is very sensitive for temperature variation. One must control the conditions and maintain carefully constant temperature level in the system during the registration of pressure values. 2 refs, 3 figs

16072 (CTH-PUBL–93-8, pp. 137-146) **Displacement due to radial forces on test samples of district heating pipes. A computerized calculation on influence of thickness and length of test samples on displacements in laboratory.** Adl-Zarrabi, B. (Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

Deformation due to thermal expansion reduces the thickness of the insulation material and thus the thermal resistance of the pipe in district heating systems. The work presented in this report concentrates on the influence of the length and thickness of test samples in laboratory experiments on polyurethane insulated district heating pipes exposed to forces applied radially. Calculations of deformation have been carried out by I-deas software which is based on the finite element method. The calculations show that the length of the test sample shall be at least 80 mm, below this level the deformation depends on the length of the test sample. A validity check of the computerized analysis has been made. A simple model has been tested and deformation have been measured and compared with the results of the computerized analysis. This comparison has shown that the results of the computerized analysis are 14% lower than the measured. This difference is probably due to the density variation of the polyurethane material over the cross section of the pipe

16073 (CTH-PUBL–93-8, pp. 147-152) **A test method for radial creep in DH-pipes.** Amby, L. (Danish Technological Institute, Aarhus (Germany). Dept. of Plastics Technology). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The work made at the Danish Technological Institute is aimed at the development of a method to test radial creep behaviour in preinsulated district heating pipes. Basically the test involves full

scale preinsulated pipes. This means that finite size segments between service pipe and casing are physically loaded to enforce creep of the whole cross section of the preinsulated pipe. The creep behaviour has been studied in two types of cellular plastics materials, FEBIS I and FEBIS II under the following conditions: Service pipe temperatures: 90 and 110 and 130 and 150 degrees C; Radial load: 0.05 MPa, 0.15 MPa, 0.25 MPa and 0.35 MPa. Five parallel tests have been carried out under each combination of conditions with a test duration of 1000 hours. Furthermore, four reference tests have been established and are still in progress. 4 figs

16074 (DOE/ER–0313/16, pp. 419-427) **Fatigue Crack Growth Rate (FCGR) behavior of Nicalon/SiC composites.** Miriyala, N. (Univ. of Tennessee, Knoxville, TN (United States)); Liaw, P.K.; McHargue, C.J.; Snead, L.L.; Hsu, D.K.; Saini, V.K. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Ultrasonic measurements were carried out on the Nicalon/SiC composite specimens to correlate elastic moduli with percentage porosity in the in-plane as well as through-thickness directions. Compact type C(T) specimens were cyclically loaded to study the fatigue crack growth behavior. However, it was difficult to initiate the crack in the specimens.

16075 (FEI–2365) **Formation of helium voids of different form in neutron irradiated boron carbide and their stability under long isothermal annealings.** Shcherbak, V.I.; Tarasikov, V.P. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1994. 21p. (In Russian). Order Number DE95628644. Source: OSTI; NTIS (US Sales Only); INIS.

Tem observations of over pressured helium voids in neutron irradiated boron carbide after high-temperature annealing (1000 - 1600 deg C) are reported. The range of void shapes considered is from spheroids to thin disks and rods. An analysis of stresses arised because of differential or anisotropic swelling of grains in stabilization of different void shapes is presented. 16 refs., 3 figs., 1 tab.

16076 (IC–94/234, pp. 23-25) **Low temperature specific heat anomalies in D- and L-Valine.** Wang Wenqing (Beijing Univ., BJ (China). Dept. of Technical Physics); Sheng Xiangrong; Yang Hongshun; Chen Zhaojia; Zhuang Zhizhong; Lou Fengming. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

The origin of chirality is closely related to the evolution of life on the Earth. Until now, no proposed mechanism has been able to explain how the completely asymmetric roles of mirror-image biological molecules could arise. Recently, Salam proposed that due to the attractive character of the parity violating force in electroweak interactions, a phase transition at low temperature could eventually lead to enantiomeric purity. Specific heat measurement is one of the powerful method to investigate the mechanism of second order phase transitions. A series of experimental tests has been undertaken and we have studied the differential specific heats of D and L Valine in single crystal state with sample mass being 100mg and 30mg respectively by differential scanning calorimetry in the temperature range 77-320K. Experimental data are presented on the temperature dependence of the specific heat in Figure. The specific heat jump at Tc 272K indicates the symmetry breaking of D-Valine. There is a smooth line of Cp-T(K) with L-Valine sample in the same temperature range. Furthermore, a specific heat peak at 272K has also been found with L-Valine as the reference sample and D-Valine. It seems to undergo a phase transition only in D-Valine. (author). 4 figs. Abstract only.

16077 (INIS-JP–028, pp. 30-32) **Irradiation effects of neutrons and electrons in semiconductors.** Kimura, Itsuro (Kyoto Univ. (Japan). Faculty of Engineering); Kanazawa, Satoshi; Kanno, Ikuo; Mikawa, Takumi; Ishihara, Shinji. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Silicon single crystal wafers were irradiated by 1 MeV electrons and by neutrons with different energy spectra. After irradiation, we measured the electrical resistivity and the concentration of defects in deep levels by the deep level transient spectroscopy (DLTS) and the isothermal capacitance transient spectroscopy (ICTS). Measured results are presented and compared each other. (author).

16078 (INIS-JP–028, pp. 80-81) **MeV ion induced damage production and accumulation in silicon.** Suzuki, Motoyuki (Kyoto Univ. (Japan). Faculty of Engineering); Okazaki, Makoto; Shin, Kazuo; Takagi, Ikuji; Yoshida, Koji. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Measurement and analysis were made for radiation damages in silicon induced by MeV ions. A single crystal silicon was bombarded by 800 keV O^+ and 700 keV Si^+ with the dose from $2x10^{15}$ up to $8x10^{15}$ cm^{-2}. And defects induced by the ion bombardments were observed by the channeling method. Some new modifications were made to the analysis of the channeling RBS spectrum so that the accuracy of the unfolded defect distribution may be improved. A new model of point-defect clustering and amorphous formation was proposed, which well reproduced the observed defect distribution in silicon. (author).

16079 (INIS-JP–028, pp. 103-105) **Irradiation effects of Ar cluster ion beams on Si substrates.** Ishii, Masahiro (Kyoto Univ. (Japan). Faculty of Engineering); Sugahara, Gaku; Takaoka, G.H.; Yamada, Isao. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Gas-cluster ion beams can be applied to new surface modification techniques such as surface cleaning, low damage sputtering and shallow junction formation. The effects of energetic Ar cluster impacts on solid surface were studied for cluster energies of 10-30keV. Irradiation effects were studied by RBS. For Si(111) substrates, irradiated with $Ar_{\geq 500}$ clusters to a dose of $1x10^{15}$ ion/cm^2 at acceleration voltage 15kV, $2x10^{14}$ atoms/cm^2 implanted Ar atoms were detected. In this case, the energy per cluster atom was smaller than 30eV; at this energy, no significant implantation occurs in the case of monomer ions. Ar cluster implantation into Si substrates occurred due to the high energy density irradiation. (author).

16080 (INIS-JP–028, pp. 123-124) **Lattice defects in electron-irradiated $CoSi_2$ studied by positron-lifetime spectroscopy.** Ito, Yasushi (Kyoto Univ. (Japan). Dept. of Metal Science and Technology); Shirai, Yasuharu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

$CoSi_2$ single crystals have been irradiated with 1.0 MeV electrons. Irradiation induced lattice defects and their properties have been investigated by positron-lifetime spectroscopy. (author).

16081 (INIS-JP–028, pp. 125-126) **Lattice defects in electron irradiated Si studied by positron lifetime spectroscopy.** Uno, Yasutada (Kyoto Univ. (Japan). Dept. of Metal Science and Technology); Shirai, Yasuharu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

FZ Si single crystals were irradiated with 1MeV electron at 100-110K. We have investigated the recovery of defects in Si by positron-lifetime spectroscopy. Isochronal annealing study shows that negatively charged divacancies migrate at about 340K and form quadrivacancies, which are annealed out at about 700K. The positron lifetimes at divacancy and quadrivacancy are 340ps and 400ps, respectively. (author).

16082 (INIS-JP–029, pp. 107-109) **Influence of electron radiation on fracture behavior of CFRP.** Komai, Kenjiro (Kyoto Univ. (Japan). Faculty of Engineering); Minoshima, Kohji; Kinoshita, Sadamu; Fujii, Nobuyuki. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Angle-ply carbon/epoxy composites were irradiated in air with electron energy of 1.5MeV, resulting in total absorbed dose of 1000Mrad. Tensile and tension-tension fatigue tests (R=0.1) were carried out for both specimens in laboratory air. Special attention was paid to fracture processes : AE signal analyses during tests and non-destructive internal damage evaluation with a scanning acoustic microscope were performed ; fracture surfaces were closely examined with a scanning electron microscope. (author).

16083 (INIS-mf–14483, pp. 97-101) **FMR study into changes of magnetic properties of amorphous alloy FeNiCrMoSiB after neutron irradiation.** Jakal, K. (Technicka Univerzita, Kosice (Slovakia). Elektrotechnicka Fakulta); Hospodar, C.; Zentko, A.; Skovranek, I. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Slovak). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Ferromagnetic resonance was used to obtain information on some properties of amorphous ferromagnetic materials, prepared by rapid quenching of the melt, after neutron irradiation. The effective polarization J_{ef} and the g-factor do not change in the amorphous alloys $Fe_{30}Ni_{48-x}Cr_xMo_2Si_5B_{15}$ ($x<4$) if the neutron flow is less than 1.10^{19} neutron.cm^{-2}. An increase in chromium content ($x>4$) results in a rapid decrease of these physical quantities - the g-factor and J_{ef} - with increasing neutron flow. (author) 3 figs., 6 refs.

16084 (INIS-mf–14483, pp. 163) **Characteristics of neutron-irradiated silicon.** Mudron, J. (VVTS, Liptovsky Mikulas (Slovakia). Katedra Fyziky); Macko, P.; Ballo, P. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Slovak). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SILICON/electric conductivity; SILICON/physical radiation effects; DAMAGING NEUTRON FLUENCE; FAST NEUTRONS; SEMICONDUCTOR RECTIFIERS; SILICON

16085 (IS-M–815) **A numerical analysis of fracture and high temperature creep characteristics of composites with discontinuous ductile reinforcements.** Biner, S.B. Ames Lab., IA (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941144–123: 1994 fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95010236. Source: OSTI; NTIS; GPO Dep.

Role of material parameters on fracture and creep behavior of discontinuous ductile fiber reinforced brittle matrix composite system was numerically investigated. For simulation of fracture behavior, the ductile fibers were modeled using a constitutive relationship that accounts for strength degradation resulting from nucleation and growth of the voids. The matrix is assumed to be elastic and fails according to requirements of a stress criterion. Results indicate that the contribution of ductile reinforcement to the work of fracture value (toughness) of the composite increases with less exhaustion of its work hardening capacity before the onset of matrix failure. At creep regime, for rigidly bonded interfaces, the creep rate of the composite is not significantly influenced by the material properties of the ductile reinforcing phase due to development of large hydrostatic stress and constrained deformation in the reinforcement. Significant increases in room temperature fracture toughness can be achieved without extensively sacrificing the creep strength by ductile discontinuous reinforcements.

16086 (IS-T–1716) **Room temperature fracture and high temperature creep deformation properties of alumina reinforced with 20 vol % particulate niobium.** Lane, S. Ames Lab., IA (United States). 20 Oct 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010234. Source: OSTI; NTIS; GPO Dep.

For this material, an increase in RT crack growth resistance of $\geq$ 300% was achieved; this property increases with increasing Nb particle size. SEM and in-situ crack growth observations show that crack bridging is the primary toughening mechanism for the increased crack growth resistance. A model was presented which uses existing models to determine the steady state bridging length given a stress intensity due to crack bridging. This model showed that the specimen size used for determining the RT fracture toughness was too small. It was also determined that the creep strain rate is in the same range as and comparable to existing studies of Al_2O_3 and Al_2O_3 systems. The creep mechanism of the composite material was found to be similar to that of unreinforced Al_2O_3 with a stress redistribution to the particle/matrix interface.

16087 (JINR-D–14-94-269(v.1), pp. 42-43) **Superconductivity of carbon tungsten containing diamond-like films.** Bozhko, A.D. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Dorfman, V.F.; Pypkin, B.I.; Kobzev, A.P.; Korneev, D.A.; Chernenko, L.P.; Shirokov, D.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. CARBON/superconducting composites; SUPERCONDUCTING COMPOSITES/critical field; TUNGSTEN/superconducting composites; AMORPHOUS STATE; CARBON; SUPERCONDUCTING FILMS; TEMPERATURE RANGE 0000-0013 K; TRANSITION TEMPERATURE; TUNGSTEN

16088 (JINR-D–14-94-269(v.1), pp. 44-45) **Application of miniature magnetic induction converters for contactless testing of HTSC magnetic properties.** Bol'shakova, I.A.; Voroshilo, G.I.; Moskovets, T.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. MAGNETOMETERS/high-tc superconductors; INDUCTION; MAGNETIC TESTING; MAGNETOMETERS; TEMPERATURE RANGE 0000-0013 K; TRANSDUCERS

16089 (JINR-D–14-94-269(v.1), pp. 57-58) **Rubber-like composite materials based on polymers and YBaCu superconducting ceramics.** Vejnger, A.I. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Zabrodskij, A.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In

Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. SUPERCONDUCTING COMPOSITES/fabrication; SUPERCONDUCTING COMPOSITES/superconductivity; CERAMICS; RUBBERS; FABRICATION; SUPERCONDUCTIVITY; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16090 (JINR-D–14-94-269(v.1), pp. 61) **Composite materials based on polyvinyl chloride and high temperature superconductors.** Voznyj, P.A. (Kievskij Pedagogicheskij Inst., Kiev (Ukraine)); Gorbik, P.P.; Dyakin, V.V.; Levandovskij, V.V.; Nagornyj, V.A.; Yanchevskij, L.K. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING COMPOSITES/chemical composition; SUPERCONDUCTING COMPOSITES/porosity; BARIUM OXIDES; BISMUTH OXIDES; CONCENTRATION RATIO; COPPER OXIDES; HIGH-TC SUPERCONDUCTORS; POWDERS; PVC; RELAXATION; POROSITY; YOUNG MODULUS; YTTRIUM OXIDES

16091 (JINR-D–14-94-269(v.2), pp. 81) **Low temperature properties of $Nd(CCl_3COO)_32H_2O$ crystal with chain structure.** Voronkova, V.K. (AN SSSR, Kazan (Russian Federation). Fiziko-Tekhnicheskij Inst.); Petrashen', V.E.; Yablokov, Yu.V.; Legenzhevich, Ya. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. NEODYMIUM COMPLEXES/j-j coupling; ANISOTROPY; HYDRATES; MAGNETIC PROPERTIES; MONOCRYSTALS; ORGANIC CHLORINE COMPOUNDS; POLYMERS; SPECTRA; SYNTHESIS; TEMPERATURE RANGE 0000-0013 K

16092 (JINR-D–14-94-269(v.2), pp. 82) **Phenomenological theory of phase transformations in C_{60} crystal.** Gibaatar, T. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst.); Shakhmatov, V.S.; Dreksler, Sh.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FULLERENES/crystal-phase transformations; CATIONS; CESIUM COMPOUNDS; CRYSTAL STRUCTURE; FULLERENES; ORDER PARAMETERS

16093 (JINR-D–14-94-269(v.2), pp. 97) **Thermal conductivity of pressed fullerene C^{60} samples.** Efimov, V.B. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Mezhov-Deglin, L.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. FULLERENES/thermal conductivity; FULLERENES; MONOCRYSTALS; POWDERS; PRESSING; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16094 (JINR-D–14-94-269(v.2), pp. 102-103) **Structure and magnetic properties of chromium complexes in SrF_2 crystals.** Zaripov, M.M. (AN SSSR, Kazan (Russian Federation). Fiziko-Tekhnicheskij Inst.); Tarasov, V.F.; Ulanov, V.A.; Shakurov, G.S.; Popov, M.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. STRONTIUM FLUORIDES/fine structure; STRONTIUM FLUORIDES/magnetic properties; CHROMIUM COMPLEXES; CRYSTAL GROWTH; MELTING; SPECTRA; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K

16095 (JINR-D–14-94-269(v.2), pp. 113) **On the detonation mechanism of autowave phenomeno- in low temperature solid-phase processes.** Kiryukhin, D.P. (AN SSSR, Chernogolovka (Russian Federation). Otdelenie Inst. Khimicheskoj Fiziki); Mozhaev, P.S.; Barelko, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. ORGANIC CHLORINE COMPOUNDS/physical radiation effects; ALKANES; CHLORINATION; DETONATION WAVES; EXPLOSIONS; GAMMA RADIATION; GLASS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16096 (JINR-D–14-94-269(v.2), pp. 122) **Radiation effects in condensed films of cryocrystals.** Kovalenko, S.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Solodovnik, A.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CARBON DIOXIDE/physical radiation effects; NITROUS OXIDE/physical radiation effects; AMORPHOUS STATE; CRYOGENICS; CRYSTAL STRUCTURE; ELECTRON BEAMS; FILM CONDENSATION; KEV RANGE 10-100; TEMPERATURE RANGE 0000-0013 K

16097 (JINR-D–14-94-269(v.2), pp. 124) **Magnetic and electric properties of new semimagnetic semiconductor $Hg_{1-x}Mn_xTe_{1-y}Se_y$.** Krylov, K.R. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Lerinman, N.K.; Ponomarev, A.I.; Sabirzyanova, L.D.; Shelushinina, N.G.; Gavalenko, N.P.; Mar'yanchuk, P.D. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30.*

Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures. Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TELLURIUM ALLOYS/magnetic susceptibility; CONCENTRATION RATIO; CURIE POINT; ELECTRIC CONDUCTIVITY; MAGNETIC FIELDS; MAGNETIC SEMICONDUCTORS; MANGANESE ALLOYS; MERCURY ALLOYS; SELENIUM ALLOYS; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16098 (JINR-D–14-94-269(v.2), pp. 165) **Electron paramagnetic resonance study of structural phase transformation in $Cs_2NaLaCl_6:Cd^{3+}$ crystal.** Usachev, A.E. (AN SSSR, Kazan (Russian Federation). Fiziko-Tekhnicheskij Inst.); Yurtaeva, S.V.; Yablokov, Yu.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CESIUM CHLORIDES/crystal-phase transformations; LANTHANUM CHLORIDES/crystal-phase transformations; CADMIUM ADDITIONS; CRYSTAL GROWTH; DOMAIN STRUCTURE; ELECTRON SPIN RESONANCE; FINE STRUCTURE; MONOCRYSTALS; SODIUM CHLORIDES; SPECTRA; THERMODYNAMIC PROPERTIES

16099 (JINR-D–14-94-269(v.2), pp. 166) **Study of exchange-binded pairs Ce^{3+}-Ce^{3+} in $Cs_2NaInCl_6$ crystal of elpasolite structure by electron paramagnetic resonance method.** Usachev, A.E. (AN SSSR, Kazan (Russian Federation). Fiziko-Tekhnicheskij Inst.); Yurtaeva, S.V.; Yablokov, Yu.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CESIUM CHLORIDES/cerium additions; CESIUM CHLORIDES/fine structure; INDIUM CHLORIDES/cerium additions; INDIUM CHLORIDES/fine structure; CONCENTRATION RATIO; CRYSTAL GROWTH; ELECTRON SPIN RESONANCE; SODIUM CHLORIDES; SPECTRA; TEMPERATURE RANGE 0000-0013 K

16100 (JINR-D–14-94-269(v.2), pp. 177-178) **Modelling of low-temperature phases of solid C_{60}.** Shpakov, V.P. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii); Belosludov, V.R.; Belosludov, R.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. FULLERENES/phase studies; CUBIC LATTICES; FULLERENES; PHASE TRANSFORMATIONS; PHONONS; TEMPERATURE RANGE 0065-0273 K; THERMODYNAMIC PROPERTIES

16101 (JINR-D–14-94-269(v.2), pp. 195-196) **Low-temperature conductivity and magnetic resistance of filament semiconductor crystals.** Bajtsar, R.I. (L'vovskij Politekhnicheskij Inst., Lvov (Ukraine)); Budzhak, Ya.S.; Varshava, S.S.; Vajnberg, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. TELLURIUM/electric conductivity; TELLURIUM ALLOYS/electric conductivity; CARRIER DENSITY; CHARGE CARRIERS; CRYSTAL STRUCTURE; FILAMENTS; HALL EFFECT; MAGNETIC FIELDS; SELENIUM ALLOYS; SEMICONDUCTOR MATERIALS; SOLID SOLUTIONS; TELLURIUM; TEMPERATURE RANGE 0000-0013 K

16102 (JINR-D–14-94-269(v.2), pp. 208-209) **Internal photoeffect and elastic properties of $Pb_{0.997}Ga_{0.003}Te$.** Vasil'ev, A.N. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Voloshok, T.N.; Gajdukov, Yu.P.; Danilova, N.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. LEAD TELLURIDES/photoconductivity; ELASTICITY; GALLIUM ADDITIONS; PHOTOCONDUCTIVITY; MAGNETIC FIELDS; MONOCRYSTALS; SEMICONDUCTOR MATERIALS; SPIN GLASS STATE; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; ULTRASONIC WAVES

16103 (JINR-D–14-94-269(v.2), pp. 212-213) **Effect of exchange interaction on the energy spectrum of localized states in p-$Hg_{1-x-y}Cd_xMn_yTe$ alloys in magnetic field.** Georgitseh, E.I. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki); Gudima, G.S.; Leporda, N.I.; Muntyanu, F.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 2 figs. CADMIUM ALLOYS/magnetic fields; TELLURIDES/magnetic fields; HALL EFFECT; MAGNETIC SEMICONDUCTORS; MANGANESE ALLOYS; MERCURY ALLOYS; PHOTOCONDUCTIVITY; PHOTOLUMINESCENCE; SPECTRA; TELLURIDES; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16104 (JINR-D–14-94-269(v.2), pp. 231) **Inter-ion Auger-transitions and current carriers duration in narrow-zone p-type semiconductors with strong hole degeneration.** Dmitriev, A.V. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Evlyukhin, A.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. CADMIUM ALLOYS/auger effect; CADMIUM ALLOYS/energy-level transitions; TELLURIDES/auger effect; TELLURIDES/energy-level transitions; CHARGE CARRIERS; ENERGY LEVELS; FERMI LEVEL; INDIUM ANTIMONIDES; IONIZATION; MERCURY ALLOYS; P-TYPE CONDUCTORS; TELLURIDES; TIME DEPENDENCE; VALENCE

16105 (JINR-D–14-94-269(v.2), pp. 267-268) **Electron scattering in modulated alloyed structure of multiple quantum pits on the basis of InGaAs/GaAs.** Kul'bachinskij, V.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Kytin, V.G.; Visser, A.; Zvonkov, B.N.; Babushkina, T.S.; Malkina, I.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 2 figs., 1 tab. INDIUM ARSENIDES/electron diffraction; ELECTRON DENSITY; GALLIUM ARSENIDES; HALL EFFECT; MAGNETIC FIELDS; MAGNETIC PROPERTIES; MAGNETORESISTANCE; PHOTOLUMINESCENCE; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

16106 (JINR-D–14-94-269(v.2), pp. 269-270) **Oscillations of transverse magnetoresistance in strong magnetic fields of intercalation compounds into graphite of acceptor type of the second step graphite.** Kul'bachinskij, V.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Ionov, S.G.; Kamenskaya, E.A.; Lapin, S.A.; Visser, F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 fig., 1 tab. GRAPHITE/magnetoresistance; GRAPHITE/oscillations; ALUMINIUM CHLORIDES; COPPER CHLORIDES; ENERGY SPECTRA; GRAPHITE; MAGNETORESISTANCE; OSCILLATIONS; HALL EFFECT; INTERSTITIALS; IODINE CHLORIDES; MAGNETIC FIELDS; MONOCRYSTALS; SHUBNIKOV-DE HAAS EFFECT; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

16107 (JINR-D–14-94-269(v.2), pp. 287-288) **Band structure and electronic properties of uniaxially strained quasiunidimensional conductor m-TaS_3.** Preobrazhenskij, V.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. TANTALUM SULFIDES/band theory; TANTALUM SULFIDES/strains; ELECTRIC CONDUCTIVITY; ELECTRONIC STRUCTURE; STRAINS; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

16108 (JINR-D–14-94-269(v.2), pp. 296-297) **Induced by deformation phase transition in thin samples o-TaS_3.** Taldenkov, A.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Preobrazhenskij, V.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. THALLIUM SULFIDES/phase transformations; DEFORMATION; ELECTRIC CONDUCTIVITY; HYSTERESIS; THICKNESS

16109 (JINR-E–14-94-366) **Surface Modification of Diamond Irradiated with Swift Heavy Ions.** Didyk, A.Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Fahrner, W.R.; Fries, Th.; Rusetskij, M.S.; Varichenko, V.S.; Zajtsev, A.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 10p. Order Number DE95626492. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Tracks and Radiation Measurements.

The surfaces of boron doped synthetic and natural diamonds have been investigated by scanning tunneling (STM) and electronic microscopy (SEM) before and after irradiation with ^{40}Ar (25 MeV), ^{84}Kr (210 MeV), ^{129}Xe (124 MeV) ions. The structures observed (STM) after irradiation showed craters ranging from 3 nm to 20 nm in diameters, which are deduced to be single ion tracks and multiple hits of ions at the nearest positions of the surface. In the case of argon ion irradiation the surface was very amorphous, but after xenon irradiation one could see parts of surface without amorphism. The phenomenological model of ion track formation is discussed. The energy and temperature criteria when crater formation under the heavy ion irradiation will take place are introduced. 17 refs., 3 figs.

16110 (JINR-E–17-93-335, pp. 153) **Lattice dynamics of fullerides M_xC_{60}.** Lipin, A.S. (AN SSSR, Moscow (Russian Federation). Inst. Spektroskopii); Mavrin, B.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FULLERENES/lattice vibrations; CESIUM COMPOUNDS; FULLERENES; INTERATOMIC FORCES; LENNARD-JONES POTENTIAL; POTASSIUM COMPOUNDS; SUPERCONDUCTORS

16111 (JINR-E–17-93-335, pp. 154) **Resonance Raman scattering of fullerides M_xC_60.** Denisov, V.N. (AN SSSR, Moscow (Russian Federation). Inst. Spektroskopii); Mavrin, B.N.; Zakhidov, A.A.; Ruani, G.; Zamboni, R.; Taliani, C. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FULLERENES/raman spectroscopy; CESIUM COMPOUNDS; FULLERENES; POTASSIUM COMPOUNDS; QUANTITATIVE CHEMICAL ANALYSIS; RUBIDIUM COMPOUNDS; SUPERCONDUCTIVITY

16112 (LA-UR–95-654) **Hydrostatic extrusion of BSCCO/Ag composite wire.** Bingert, J.F.; Bingham, B.L.; Sebring, R.J.; Kelly, A.M. Los Alamos National Lab., NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950201–9: Annual meeting and exhibition of the Minerals, Metals and Materials Society (TMS), Las Vegas, NV (United States), 12-16 Feb 1995). Order Number DE95007862. Source: OSTI; NTIS; GPO Dep.

The application of hydrostatic extrusion processing to composite wire fabrication offers several advantages over conventional reduction techniques. These include enhanced uniformity, increased reduction capability, and successful extrusion of normally brittle materials. Specifically, this work involved an experiment to screen the effects of seven extrusion process parameters on the uniformity and density of as-extruded BSCCO-core wire, and the required extrusion pressure. Results suggest the following factors to be potentially significant: (1) back pressure, extrusion ratio, and die angle on core uniformity, (2) packing method, extrusion ratio, silver

powder additions, and temperature on density, and (3) extrusion ratio and temperature on extrusion pressure.

16113 (SAND–94-2298C) **Dynamic brittle material response based on a continuum damage model.** Chen, E.P. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950686–1: Joint applied mechanics and materials summer meeting, Los Angeles, CA (United States), 28-30 Jun 1995). Order Number DE95006306. Source: OSTI; NTIS; GPO Dep.

The response of brittle materials to dynamic loads was studied in this investigation based on a continuum damage model. Damage mechanism was selected to be interaction and growth of subscale cracks. Briefly, the cracks are activated by bulk tension and the density of activated cracks are described by a Weibull statistical distribution. The moduli of a cracked solid derived by Budiansky and O'Connell are then used to represent the global material degradation due to subscale cracking. This continuum damage model was originally developed to study rock fragmentation and was modified in the present study to improve on the post-limit structural response. The model was implemented into a transient dynamic explicit finite element code PRONTO 2D and then used for a numerical study involving the sudden stretching of a plate with a centrally located hole. Numerical results characterizing the dynamic responses of the material were presented. The effect of damage on dynamic material behavior was discussed.

16114 (SAND–94-3247C) **Formation of cavities in Si and their chemisorption of metals.** Follstaedt, D.M.; Myers, S.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503125–1: 9. international conference on microscopy of semiconducting materials, Oxford (United Kingdom), 20-23 Mar 1995). Order Number DE95009586. Source: OSTI; NTIS; INIS; GPO Dep.

Nanometer-size cavities formed in Si by He^+ implantation and annealing are examined with cross-section TEM. During annealing at 700 C or above, He degasses from the specimens, leaving uhv cavities with reactive Si bonds on their walls. Cavity microstructures have been characterized in detail for an implanted fluence of 1×10^{17} He/cm^2: cavity volume remains approximately constant (0.75 lattice sites/He) for anneals from 700 to ~1000 C, while surface area (3 to 7 times the wafer area) decreases with temperature as the cavities coarsen. The cavities are found to getter up to ~1 monolayer of Cu or Au from solution in Si without second-phase formation, thus identifying the trapping mechanism as chemisorption on the cavity walls.

16115 (SAND–95-0351C) **Models for predicting damage evolution in metal matrix composites subjected to cyclic loading.** Allen, D.H. (Texas A and M Univ., College Station, TX (United States). Center for Mechanics of Composites); Hurtado, L.D.; Helms, K.L.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. Grant F49620-94-1-0341. (CONF-950788–6: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95007734. Source: OSTI; NTIS; GPO Dep.

A thermomechanical analysis of a continuous fiber metal matrix composite (MMC) subjected to cyclic loading is performed herein. The analysis includes the effects of processing induced residual thermal stresses, matrix inelasticity, and interface cracking. Due to these complexities, the analysis is performed computationally using the finite element method. Matrix inelasticity is modelled with a rate dependent viscoplasticity model. Interface fracture is modelled by the use of a nonlinear interface constitutive model. The problem formulation is summarized, and results are given for a four-ply unidirectional SCS-6/β21S titanium composite under high temperature isothermal mechanical fatigue. Results indicate rate dependent viscoplasticity can be a significant mechanism for dissipating the energy available for damage propagation, thus contributing to improved ductility of the composite. Results also indicate that the model may be useful for inclusion in life prediction methodologies for MMC's.

16116 (SAND–95-0379C) **High strain rate properties and constitutive modeling of glass.** Holmquist, T.J. (Alliant Techsystems Inc., Hopkins, MN (United States)); Johnson, G.R.; Lopatin, C.M.; Grady, D.E.; Hertel, E.S. Jr. Sandia National Labs., Albuquerque, NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950537–2: 15. international symposium on ballistics, Haifa (Israel), 21-24 May 1995). Order Number DE95008434. Source: OSTI; NTIS; GPO Dep.

This paper presents experimental data and computational modeling for a well-defined glass material. The experimental data cover a wide range of strains, strain rates, and pressures that are obtained from quasi-static compression and tension tests, split Hopkinson pressure bar compression tests, explosively driven flyer plate impact tests, and depth of penetration ballistic tests. The test data are used to obtain constitutive model constants for the improved Johnson-Holmquist (JH-2) brittle material model. The model and constants are then used to perform computations of the various tests.

16117 (SAND–95-0583C) **Models of transport, gas-phase and surface chemistry in diamond chemical vapor deposition.** Dandy, D.S. (Colorado State Univ., Fort Collins, CO (United States). Dept. of Chemical Engineering); Coltrin, M.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950518–4: 187. meeting of the Electrochemical Society, Reno, NV (United States), 21-26 May 1995). Order Number DE95009861. Source: OSTI; NTIS; GPO Dep.

This paper presents an analysis of the Chemical Vapor Deposition of diamond thin films in a direct-current (dc) arc-jet reactor. The analysis discussed here includes a model of the performance of the arc-jet hydrogen excitation source, chemistry in the free-stream region, diffusive transport and chemistry in the boundary layer and at the surface. The surface chemistry model includes pathways for deposition of diamond, as well as creation of defects in the diamond lattice.

16118 (SAND–95-0664C) **GCMS and FTIR studies of by-product inhibited growth and the rate-limiting step in TEOS-based SiO_2 CVD.** Bartram, M.E. (Sandia National Labs., Albuquerque, NM (United States). Chemical Processing Science Dept.); Moffat, H.K. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950518–3: 187. meeting of the Electrochemical Society, Reno, NV (United States), 21-26 May 1995). Order Number DE95009863. Source: OSTI; NTIS; GPO Dep.

To improve process reliability and deposition methods, it is essential to identify the rate-limiting step in TEOS-based SiO_2 CVD and its dependence on process conditions. For this purpose, experiments designed to evaluate by-product inhibition effects and to identify the rate-limiting step in TEOS decomposition have been carried out in a research reactor using GCMS and FTIR. By repetitively sampling a series of reactions in which TEOS was first mixed with ethylene, ethanol, and water in the gas-phase, GCMS was used to show clearly that these reaction by-products do not inhibit the heterogeneous reaction step on SiO_2 at 1,000K. FTIR was used to determine that ethoxy groups from TEOS dissociative chemisorption have a significant lifetime on the SiO_2 surface at CVD temperatures and have an activation energy for decomposition of 16kcal/mol$\pm$4kcal/mol. This is much higher than the activation energy of 6 kcal/mol reported for the initial chemisorption step and is near the 22 kcal/mol reported for the overall activation energy for SiO_2 deposition in a cold-wall reactor. These results suggest that, whether or not surface ethoxy groups inhibit TEOS reactions, their decomposition may be directly related to the rate-limiting step in SiO_2 deposition.

16119 (SBI-MEDD–107) **Glass in the building envelope - a review.** Munch-Andersen, J.; Ellum, J.C. Statens Byggeforskningsinstitut, Hoersholm (Denmark). 1995. 56p. (In Danish). Contract ENS-1213/93-0023. Order Number DE95772419. Source: OSTI; NTIS.

EFP-93.

Glass is increasingly used in the building envelope, also in solar walls and glass roofs, to make use of solar radiation. The document reviews the existing knowledge of the design of glass in the building envelope. It deals with the description of the strength of glass, the strength degradation as function of the load history, the statistical description of the strength of a glass pane, the determination of stresses and strains, the necessary knowledge of loads needed to account for the strength degradation and the calculation of failure probability. The coupling effect of multi-layered glass panes (laminated glass or insulating glazing), thermal stresses, safety glazing and fire precautions is discussed. Glass structures must be designed for the entire load history, but only the larger values and their duration need to be considered for practical purposes. Lack of knowledge concerning parameter values might an explanation for the severe discrepancy between the theoretical knowledge and the design used. Assuming that ordinary, vertical glass panes subjected only to wind load and designed according to current rules is designed satisfactory in such a way that the safety level through experience has proved to be satisfactory, it is possible to obtain design rules for instance for glass roofs with the same level of safety. It is shown that it is likely that the load duration can be taken into account by means of simple factors applied to the code loads, and that the load combinations could be very simple. (AB) (74 refs.)

16120 (SKB-TR–94-25) **Kinetic modelling of bentonite-canister interaction. Long-term predictions of copper canister corrosion under oxic and anoxic conditions.** Wersin, P. (MBT Tecnologia Ambiental, Cerdanyola (Spain)); Spahiu, K.; Bruno, J. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Sep 1994. 38p. Order Number DE95626491. Source: OSTI; NTIS; INIS.

A new modelling approach for canister corrosion which emphasises chemical processes and diffusion at the bentonite-canister interface is presented. From the geochemical boundary conditions corrosion rates for both an anoxic case and an oxic case are derived and uncertainties thereof are estimated via sensitivity analyses. Time scales of corrosion are assessed by including calculations of the evolution of redox potential in the near field and pitting corrosion. This indicates realistic corrosion depths in the range of 10^{-7} and $4*10^{-5}$ mm/yr, respectively for anoxic and oxic corrosion. Taking conservative estimates, depths are increased by a factor of about 200 for both cases. From these predictions it is suggested that copper canister corrosion does not constitute a problem for repository safety, although certain factors such as temperature and radiolysis have not been explicitly included. The possible effect of bacterial processes on corrosion should be further investigated as it might enhance locally the described redox process. 35 refs, 11 figs, 6 tabs.

16121 (UCRL-JC–115700) **Metallic laminates for engine applications.** Lesuer, D.R.; Syn, C.K. Lawrence Livermore National Lab., CA (United States). Jun 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940641–2: 8. world ceramic congress, Florence (Italy), 29 Jun - 4 jul 1994). Order Number DE95010259. Source: OSTI; NTIS; GPO Dep.

Laminated metal composites consist of alternating metal (or metal matrix composite) layers that are bonded together. This paper reviews the processing of these materials and the properties relevant to engine applications. These properties include strength, toughness and damping capacity. Laminates can have very attractive properties relative to other structural materials for weight critical applications requiring high stiffness, strength and fracture toughness. The structure-property correlations that determine these properties are described.

16122 (UCRL-JC–118417) **Simulation of fracture in compression using a field-theory model.** Blair, S.C. (Lawrence Livermore National Lab., CA (United States)); Cook, N.G.W. Lawrence Livermore National Lab., CA (United States). 23 Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950655–6: 35. US symposium on rock mechanics, South Lake Tahoe, NV (United States), 4-7 Jun 1995). Order Number DE95009874. Source: OSTI; NTIS; GPO Dep.

Compressive fracture in rock is simulated and analyzed in terms of crack patterns and crack strain energy. Results indicate that initially cracks are randomly located and non-interesting. When ~10% of the sites are cracked, crack interaction becomes important and cluster of cracked sites form and extend. Finally, a few critical connecting cracks form and link the clusters to cause failure.

40 CHEMISTRY

Refer also to citation(s) 17304, 17430

4001 Analytical and Separations Chemistry

Refer also to citation(s) 14902, 14956, 14994, 15220, 15724, 15781, 16451, 16456, 16491, 16522, 16530, 16551, 16555, 16855

16123 (ANL/ER/CP–84530) **Faster, cheaper radioanalytical methods.** Erickson, M.D.; Aldstadt, J.H.; Alvarado, J.S.; Crain, J.S.; Orlandini, K.A.; Smith, L.L. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–115: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009913. Source: OSTI; NTIS; INIS; GPO Dep.

This project focuses on improvement of radioanalytical methods, with an emphasis on faster and cheaper routine methods. The authors have developed improved methods for the separation of environmental levels of technetium-99, radium, and actinides from soil and water; separation of actinides from soil and water matrix interferences; and isolation of strontium. Among the novel techniques for separation that are being used are element and class-specific resins and membranes. The authors have also developed methods for the simultaneous detection of multiple isotopes by using inductively coupled plasma-mass spectrometry (ICP-MS). Because of its mass-selective mode of detection, ICP-MS requires less rigorous chemical separations than does radiochemical analysis. In addition, improvements in the limits of detection, the volume of the sample and the time of analysis were obtained by using other techniques of sample introduction, such as ultrasonic nebulization, automated batch separation and electrothermal vaporization. Investigation of integration and automation of the separation methods with the ICP-MS method using flow injection analysis is underway. A solid scintillation device has been developed and tested for measurement and identification of low-energy beta-emitting radionuclides; application of this technique will eliminate the generation of mixed-waste counting cocktails. The final product of all activities will be methods that are available and are acceptable for use in regulatory situations. Concerted efforts are being made to facilitate implementation of the methods at DOE sites to realize the improvements offered.

16124 (BARC–1994/E/025) **Preparation of carbonaceous electrodes and evaluation of their performance by electrochemical techniques.** Sharma, H.S. (Bhabha Atomic Research Centre, Bombay (India). Fuel Chemistry Div.); Manolkar, R.B.; Kamat, J.V.; Marathe, S.G.; Biswas, A.R.; Kulkarni, P.G. Bhabha Atomic Research Centre, Bombay (India). 1994. 40p. Order Number DE95627533. Source: OSTI; NTIS (US Sales Only); INIS.

Carbonaceous electrodes, from glassy carbon (GC), graphite rod or graphite powder, have been prepared for coulometric and voltammetric investigation. Beaker type graphite electrode of larger surface area was used as working electrode for the analysis of uranium and plutonium in solution by coulometry. Results have shown usefulness of the electrode for both uranium and plutonium analysis. Thus the graphite electrode can be used in place of mercury for uranium analysis and in place of platinum gauze for plutonium analysis. GC electrode (from French and Indian material), graphite or carbon paste electrode of smaller surface area prepared here have also been found to give satisfactory performance as could be observed from cyclic voltammetric (cv) patterns for standard $K_3Fe(CN)_6/K_4Fe(CN)_6$ redox system. Especially the GC electrode, (French) polished to 1μ finish with diamond paste gave very low values (1μ amp.) of background current in 1M KCl and the difference in cathodic and anodic peak potentials (δE values)

was close to 60 mV from one electron transfer. Therefore the electrode can be used for various types of electrochemical studies relating to redox potentials, reaction mechanism, kinetic parameters etc. of different electrode processes. (author). 20 refs., 3 tabs., 10 figs., 8 photographs.

16125 (BARC–1994/E/029) **An ICP-AES method for the determination of trace metals in uranium by solvent extraction using KSM-17.** Jacob, Mary (Bhabha Atomic Research Centre, Bombay (India). Fuel Reprocessing Division); Radhakrishnan, K.; Dhami, P.S.; Kulkarni, V.T.; Joshi, M.V.; Patwardhan, A.B.; Ramanujam, A.; Mathur, J.N. Bhabha Atomic Research Centre, Bombay (India). 1994. 18p. Order Number DE95627534. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes the studies carried out for the determination of trace metallic impurities in uranium solutions. Uranium matrix is separated from the impurity elements by its selective extraction using 2-ethylhexyl hydrogen 2-ethylhexyl phosphonate (KSM-17, equivalent to PC88A). The aqueous phase is analysed for trace impurities by inductively coupled argon plasma atomic emission spectrometry. The studies also include recovery of impurities at various acidities and spectral interferences of uranium over the analyte element channels. Based on the above studies, a method has been standardised for the analysis of nineteen elements in uranium solutions. The relative standard deviation of the method for various elements is in the range of +- 1-5%. (author). 7 refs., 8 tabs., 1 fig.

16126 (BNL–61149, pp. 82-104) **Surface-sensitive analysis of materials used in the production of PET radioisotopes.** Alvord, B. (CTI, Inc., Knoxville, TN (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The use of computer operated cyclotrons for clinical production of radiotracers for PET has made data on target performance (observed by a variety of users and with large statistics) recently available. The issues of consistent fluoride ion yields and repeatable FDG synthesis yields are of singular importance to the ordinary clinical user. For widespread manufacturing of compounds like FDG, it will be essential to have any issues affecting yield well understood. Much work has been done on water targets looking at the effect on yield of impurities in target water (before and after irradiation), dose rate, synthesis setup, overpressures, and cooling conditions. It is in this environment that the authors have begun to look at the surface chemistry of target body and window materials in order to better understand the mechanisms of target performance and lifetime. Ample anecdotal evidence exists for phenomena of "burn in," slow or rapid deterioration due to contaminants in target water, and the required target rebuild or cleaning procedure for best yields. However quantitative methods for understanding the same phenomena are few. One of the most commonly used diagnostic tools for target failure analysis to date has been simple visual inspection of the windows and target body during target rebuilding. One can get a good idea of beam hot spots, contamination in helium recirculation systems, and accumulation of unwanted material in the beam strike. However, the color and finish of a deposit is subject to interpretation, and yields no chemical information or thickness of deposit. More quantitative methods exist. The work here focusing on the use of ESCA for target surface analysis.

16127 (BNL–61149, pp. 121-125) **Recovery of enriched stable isotopes in radionuclide production.** Razbash, A.A. (Cyclotron Co. Ltd., Obninsk (Russian Federation)); Sevastyanov, Yu.G.; Polyakov, O.N.; Krasnov, N.N.; Konyakhin, N.A.; Tolstouhov, Yu.V.; Maklachkov, A.G. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The wide application of radionuclides in different fields of science and industry demanded an increase of their production. One of the ways to increase the radionuclide production on present cyclotrons is the use of the targets from enriched stable isotopes. This allows one to raise the productivity in some cases by two or more times and to increase radionuclidic purity. It should be noted, however, that enriched stable isotopes are very expensive. Therefore it is advisable to use such raw materials more than once. In the last ten years, The authors have used stable isotopes extensively for making of targets. Zinc-67 and zinc-68, cadmium-111 and cadmium-112, nickel-58, silver-109, thallium-203 have been employed for the production of gallium-67, indium-111, cobalt-57, cadmium-109 and thallium-201, respectively. The technique for the recovery of enriched stable isotopes has been developed. In this report the schemes of the recovering processes are presented.

16128 (CONF-950226–36) **Ultrasensitive fluorescence detection and photophysics in microdroplets.** Barnes, M.D.; Whitten, W.B.; Ramsey, J.M. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995. Order Number DE95010283. Source: OSTI; NTIS; GPO Dep.

Fluorescence detection of single molecules in room temperature liquids is usually plagued by many difficulties such as finite saturated absorption rate, finite laser-analyte interaction time, and analyte diffusion. Our approach to single molecule detection in liquids has been to use microdroplets as the sample medium which has many advantages over conventional "bulk" techniques such as extended laser-analyte interaction time, a probe volume defined by the droplet, and modified radiative properties of molecules due to interactions with droplet resonances. We have demonstrated detection of single rhodamine molecules with signal-to-noise ratios on the order of 30 using levitated microdroplets as the sample medium. The focus of current work is on single molecule detection in falling droplet streams with analysis rates on the order of 5–10 kHz.

16129 (DOE/ER/45233–10) **Application of spin-sensitive electron spectroscopies to investigations of electronic and magnetic properties of solid surfaces and epitaxial systems.** Walters, G.K.; Dunning, F.B. Rice Univ., Houston, TX (United States). Feb 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-86ER45233. Order Number DE95010154. Source: OSTI; NTIS; GPO Dep.

The principal objectives of the research have been improved understanding and characterization of electronic and magnetic properties of surfaces, adsorbates and epitaxially-grown systems. Toward this end, substantial effort has also been directed toward better elucidation of the dynamical processes involved in electron-surface and atom-surface interactions, since these provide the bases for electron spectroscopies commonly used for probing surface properties. To accomplish these objectives, three novel spin-sensitive electron spectroscopies have been developed in this laboratory, and these have been exploited to provide new information not accessible using the corresponding conventional (non-spin-sensitive) spectroscopies. These spectroscopies and the new knowledge that has resulted from their application are discussed briefly in the following three sections of the report: spin polarized low energy electron diffraction (SPLEED); spin polarized electron energy loss spectroscopy (SPEELS); and spin polarized (metastable atom) deexcitation spectroscopy (SPMDS).

16130 (HW–41397-Ch.3) **Nuclear metallurgy lectures. Chapter 3.** Evans, T.W. Hanford Works, Richland, WA (United States). 18 May 1956. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010023. Source: OSTI; NTIS; GPO Dep.

This lecture gives an understanding of what can be learned about the structure of metallic materials by the use of x-ray diffraction (XRD) methods. After reviewing the principles of XRD by crystals, the lecture discusses structure determinations, preferred orientation and its measurement, and line broadening and its measurement with emphasis on problems pertaining to reactor application of metals.

16131 (INIS-BR–3492) **Review of geochronological context of basic dikes from Para de Minas, Esmeraldas, Minas Gerais State, Brazil.** Teixeira, W. (Sao Paulo Univ., SP (Brazil). Inst. de

Geociencias). Sao Paulo Univ., SP (Brazil). Inst. de Geociencias. 1989. 3p. (In Portuguese). (CONF-890023–: Workshop of precambrian mafic dikes from Brazil, Sao Paulo (Brazil), 1989). Order Number DE95627515. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLUTONIC ROCKS/isotope dating; ARGON; BRAZIL; GEOLOGIC AGES; GEOLOGY; POTASSIUM

16132 (INIS-BR–3493) **Geochronology from Carajas Mineral Province; data synthesis and new challenges.** Macambira, M.J.B. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Lafon, J.M. Sociedade Brasileira de Geologia, Belem, PA (Brazil). Nucleo Norte. 1994. 5p. (In Portuguese). (CONF-9405311–: 4. symposium on geology of the Amazon, Belem (Brazil), 28 May - 3 jun 1994). Order Number DE95627516. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/isotope dating; ZIRCON/isotope dating; BRAZIL; COMPARATIVE EVALUATIONS; GEOLOGIC AGES; GEOLOGY; GNEISSES; GRANITES; ZIRCON

16133 (INIS-BR–3494) **Comparative study between geochronological methods used in zircons; the case of Maria River granodiorite, Carajas Province - Brazil.** Macambira, M.J.B. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Scheller, T. Sociedade Brasileira de Geologia, Belem, PA (Brazil). Nucleo Norte. 1994. 5p. (In Portuguese). (CONF-9405311–: 4. symposium on geology of the Amazon, Belem (Brazil), 28 May - 3 jun 1994). Order Number DE95627517. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ZIRCON/isotope dating; BRAZIL; COMPARATIVE EVALUATIONS; EVAPORATION; GRANODIORITES; LEAD; URANIUM; ZIRCON

16134 (INIS-BR–3496) **A discussion about the ortho gneisses source from Araguaia Belt basement based in Sr and Nd isotopes.** Moura, C.A.V. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Gaudette, H.E. Sociedade Brasileira de Geologia, Belem, PA (Brazil). Nucleo Norte. 1994. 5p. (In Portuguese). (CONF-9405311–: 4. symposium on geology of the Amazon, Belem (Brazil), 28 May - 3 jun 1994). Order Number DE95627518. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GNEISSES/isotope dating; BRAZIL; GEOLOGIC AGES; GNEISSES; ISOTOPE RATIO; NEODYMIUM; STRONTIUM

16135 (INIS-BR–3497) **Pb/Pb geochronology in zircon from Cumaru granodiorite, Gradaus Sierra, Para State, Brazil.** Lafon, J.M. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Scheller, T. Sociedade Brasileira de Geologia, Belem, PA (Brazil). Nucleo Norte. 1994. 5p. (In Portuguese). (CONF-9405311–: 4. symposium on geology of the Amazon, Belem (Brazil), 28 May - 3 jun 1994). Order Number DE95627519. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ZIRCON/isotope dating; BRAZIL; GEOLOGIC AGES; GEOLOGY; GRANODIORITES; LEAD; MOUNTAINS; ZIRCON

16136 (INIS-BR–3498) **Geochemistry, petrogenesis and Rb-Sr geochronology from Uaupes River Granite: implication for the evolution of Negro River Province, Amazon.** Dall'Agnol, R. (Para Univ., Belem, PA (Brazil). Centro de Geociencias); Macambira, M.J.B. Sociedade Brasileira de Geologia, Belem, PA (Brazil). Nucleo Norte. 1994. 4p. (In Portuguese). (CONF-9405311–: 4. symposium on geology of the Amazon, Belem (Brazil), 28 May - 3 jun 1994). Order Number DE95627520. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GRANITES/geochemistry; GRANITES/isotope dating; GRANITES/petrogenesis; BRAZIL; GEOLOGY; GRANITES; GEOCHEMISTRY; PETROGENESIS; PETROLOGY; RUBIDIUM; STRONTIUM; TECTONICS

16137 (INIS-BR–3500) **Measurement of the ^{235}U absolute activity.** Bueno, C.C.; Santos, M.D.S. Pontificia Univ. Catolica de Sao Paulo, SP (Brazil). Dept. de Fisica. 1993. 11p. (CONF-9312106–: Symposium on Experimental Techniques in Physics, Sao Paulo (Brazil), 10-11 Dec 1993). Order Number DE95627521. Source: OSTI; NTIS (US Sales Only); INIS.

The absolute activity of ^{235}U contained in a sample was measured utilizing a sum-coincidence circuit which selects only the alpha particles emitted simultaneously with the 143 KeV gamma radiations from the ^{231}Th (product nucleus). The alpha particles were detected by means of a new type of a gas scintillating chamber, in which the light emitted by excitation of the gas atoms, due to the passage of a charged incoming particle, has its intensity increased by the action of an applied electric field. The gamma radiations were detected by means of a 1'x $1^{1/2}$ NaI (Tl) scintillation detector. The value obtained for the half-life of ^{235}U, $(7.04+-0.01)10^{8}$ y, was compared with the data available from various observers with used different experimental techniques. It is shown that our results are in excellent agreement with the best data available on the subject. (author) 15 refs, 5 figs, 1 tab.

16138 (INIS-BR–3501) **On the use of thin natural uranium film dosimetry in mineral dating by the fission track method.** Hadler Neto, J.C. (Universidade Estadual de Campinas, SP (Brazil)); Iunes, P.J.; Khouri, M.C. Sociedade Brasileira de Geofisica, Rio de Janeiro, RJ (Brazil). 1993. 7p. (CONF-9311307–: 3. International Congress of the Brazilian Geophysical Society, Rio de Janeiro (Brazil), 7-11 Nov 1993). Order Number DE95627522. Source: OSTI; NTIS (US Sales Only); INIS.

Three obsidian samples were irradiated in a neutron facility and their age was measured by the fission track method; using a thin uranium film dosemeter. The results were compared to others made previously on the same type of rock using conventional neutron dosimetry. The use of thin uranium film for age determination is discussed. (F.E.). 20 refs, 4 tabs.

16139 (INIS-JP–028, pp. 38-39) **PIXE analysis for trace-elements in dust-particles.** Tazawa, Yuji (Kyoto Univ. (Japan). Dept. of Physics); Ogino, Koya. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

PIXE analysis have been performed to study for trace-elements in dust-particles such as meteorite fragments using with Tandem-Vande-Graaf accelerator. X-ray spectra obtained PIXE method were compared to find better analytical conditions for dust-particles and powdered milks under the various conditions of ion beam, absorbers and target preparation. (author).

16140 (INIS-JP–029, pp. 140-142) **Chemical characteristics of rain-water.** Kasahara, Mikio (Kyoto Univ., Uji (Japan). Inst. of Atomic Energy); Ogiwara, Hiroshi; Park, Jeong-Ho; Takahashi, Kanji. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Rain drops were collected every 0.1mm precipitation. Rain water was passed through a Nuclepore filter with 0.2μm pore-size. Chemical species in the filtrate and the residue are defined as a soluble and an insoluble component, respectively. Dry PIXE samples from filtrate were prepared bydropping and evaporating successively ten 20μ l drops with a micropipet onto a non-hole thin film. The drops were dried in a spot-like of 4mmϕ such that all of the samples were bombarded by 6mmϕ ion beam. Elemental concentrations were determined with 2.0 MeV H^{+} beam from a Tandem accelerator. X-rays with 0.5-14.8keV energy were detected by a Si(Li) detector after passing through a 39.3μm thick Maylar absorber. The concentrations of all analyzed 15 elements in both insoluble and soluble components decreased rapidly from the beginning of rain to the amount of 0.3mm rain fall as well asban electrical conductivity. Most of Si and Fe were insoluble, on the other hand, most of S and Cl were soluble. (author).

16141 (INIS-JP–029, pp. 143-144) **Determination of trace elements in wood.** Nishimura, Kazuo (Kyoto Univ. (Japan). Faculty of Agriculture); Katayama, Yukio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

NBS Orchard leaves and cellulose powder were used to normalize the analytical data, obtained from PIXE analysis, for wood samples collected at different sampling sites. Appropriate amount of heavy metals solution were added to cellulose powder to make 5, 10, 15 and 20 μg/g content. Peak count per unit element added in cellulose powder were relatively lower in Fe, Zn, Sb and As. Because, chloride form of Fe and Zn have higher volatility than sulfate and phosphate salts. Sb and As were activated by ion beam. Thus, these element may evaporate under vacuum condition. (author).

16142 (INIS-JP–029, pp. 145-146) **Increased aluminum content in the spinal cord of amyotrophic lateral sclerosis and Parkinsonism-dementia of Guam and in the Kii Peninsula of Japan.** Wakayama, Ikuro (Wakayama Medical Coll. (Japan)); Yoshida, Sohei; Sasajima, Kazuhisa; Takada, Jitsuya; Yoshida, Koichi. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Aluminum content in the lumbar spinal cord of patients with amyotrophic lateral sclerosis(ALS) and Parkinsonism-dementia(PD) in the Kii Peninsula of Japan and in the island of Guam was measured using a particle induced X-ray emission analysis. We demonstrated that aluminum content was increased in the spinal cord of patients with ALS in two foci of the western Pacific, indicating aluminum to be a important factor in the process of spinal motor neuron degeneration. (author).

16143 (INIS-mf–14483, pp. 111-116) **Study of Mars surface using Moessbauer spectroscopy.** Lipka, J. (STU, Bratislava (Slovakia). Department of Nuclear Physics and Technology); Miglierini, M.; Madsen, M.B.; Knudsen, M.; Koch, C.B.; Morup, S. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Discussed is the potential of Moessbauer spectroscopy in the planned space program which will be concerned with on-site examination of iron compounds on the planet Mars. Attention is paid to the scanning of spectra in the transmission and reflection modes. The following 2 problems must be addressed to obtain good quantitative results: (i) the time of Moessbauer spectra measurement in the reflection mode, which is nearly one order of magnitude longer than in the transmission mode, and (ii) complications in the reflection mode which are associated with the variable thickness of the samples, whose surface does not lend itself to treatment. (Z.S.). 2 tabs., 2 figs., 5 refs.

16144 (INIS-mf–14483, pp. 149) **Determination of light elements in materials using the coincidence method.** Cervena, J. (Ceska Akademie Ved, Rez (Czech Republic). Ustav Jaderne Fyziky); Vacik, J.; Hnatowicz, V.; Kvitek, J.; Havranek, V. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BORON/nuclear reaction analysis; HELIUM/nuclear reaction analysis; LITHIUM/nuclear reaction analysis; NITROGEN/nuclear reaction analysis; NUCLEAR REACTION ANALYSIS/coincidence methods; BORON; HELIUM; LITHIUM; NEUTRON REACTIONS; NITROGEN

16145 (INIS-mf–14483, pp. 149) **Quality control of air using nuclear analytical methods.** Havranek, V. (Ceska Akademie Ved, Rez (Czech Republic). Ustav Jaderne Fyziky); Hnatowicz, V.; Kvitek, J.; Obrusnik, I. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AIR/pixe analysis; FLUORINE/nuclear reaction analysis; AEROSOLS; AIR; FLUORINE; FLY ASH; PROMPT GAMMA RADIATION; PROTON REACTIONS; QUALITY CONTROL

16146 (INIS-mf–14483, pp. 151) **Nuclear analytical methods at the Institute of Nuclear Physics, Czech Academy of Sciences.** Perina, V. (Ceska Akademie Ved, Rez (Czech Republic). Ustav Jaderne Fyziky); Hnatowicz, V.; Kvitek, J.; Havranek, V.; Dzmuran, R.; Vosecek, V.; Obrusnik, I. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR REACTION ANALYSIS/quantitative chemical analysis; PIXE ANALYSIS/quantitative chemical analysis; RUTHERFORD SCATTERING/quantitative chemical analysis; BACKSCATTERING; PROMPT GAMMA RADIATION; PROTON REACTIONS; SPATIAL DISTRIBUTION

16147 (INIS-mf–14483, pp. 158) **Study of iron sulfides in coal using Moessbauer spectroscopy.** Maslan, M. (Palackeho Univ., Olomouc (Czech Republic). Prirodovedecka Fakulta); Kubinek, R.; Zak, D.; Kozusnikova, A.; Chmielova, M. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BLACK COAL/iron sulfides; IRON SULFIDES/moessbauer effect; CONCENTRATION RATIO; SULFUR

16148 (INIS-mf–14528) **Intercomparison measurements of surface soil contamination with in-situ gamma ray spectrometry. Pt.2. Natural radionuclides.** Winkelmann, I. Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. 1994. 20p. (In German). (CONF-9410338–: Environmental Radioactivity: national seminar with international participation, Sofia (Bulgaria), 11-13 Oct 1994). Order Number DE95627523. Source: OSTI; NTIS (US Sales Only); INIS.

The intercomparison program was performed by the Federal Office of Radiation Protection in October 1993. 17 teams - 10 from Germany and 7 from other european countries - took part in the measurements. Three characteristic sites at the Ronneburg (Wismut Ltd.) Uranium Mine facility are investigated: Absetzerhalde, Parkplatz Drosen and Gessenhalde. The specific activity of the nuclides from U-Ra- and Th-series and of ^{40}K was measured at 5 locations. Most of the participants reported data about all nuclides from these decay chains measured by gamma ray spectrometry. Basically, the measured data were in good agreement and, as expected, the radionuclides from Th-series agreed better than those from U-Ra-series. Some participants reported significantly higher values (compared to the total mean value) for ^{226}Ra (up to 90%). For other nuclides the deviations from the total mean value are within the measurement's uncertainty. The following specific activities are obtained: (1) For Absetzerhalde site: ^{238}U (^{226}Ra) - 1900 Bq/kg (1600 Bq/kg); ^{232}Th - 40 Bq/kg; ^{40}K - 640 Bq/kg. (2) For Parkplatz Drosen site: ^{238}U (^{226}Ra) - 700 Bq/kg (600 Bq/kg); ^{232}Th - 20 Bq/kg; ^{40}K - 460 Bq/kg. (3) For Gessenhalde site: ^{238}U

(^{226}Ra) - 1200 Bq/kg (1800 Bq/kg); ^{232}Th - 30 Bq/kg; ^{40}K - 430 Bq/kg. 10 tabs., 14 figs., 3 refs. (orig.).

16149 (INIS-mf–14529, pp. 42) **Stable isotope investigations.** Pak, E. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STABLE ISOTOPES/age estimation; STABLE ISOTOPES/sulfur isotopes; CARBON ISOTOPES; CARBON 14; EVAPORATION; ISOTOPE DATING; MASS SPECTROMETERS; ROCKS

16150 (INIS-mf–14529, pp. 43-44) **Radiography of watermarks in medieval papers with soft X-rays.** Nowotny, R. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Schmidt, W.; Haidinger, A.; Lackner, F. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BETA RADIOGRAPHY/paper; AGE ESTIMATION; PAPER; CARBON 14; ISOTOPE DATING; SOFT X RADIATION

16151 (INIS-mf–14529, pp. 44) **Radiocarbon dating laboratory.** Pak, E.; Vonach, W. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/carbon 14; AGE ESTIMATION/isotope dating; AGE ESTIMATION/laboratories; LABORATORIES; AUSTRIA; IAEA; QUALITY ASSURANCE

16152 (INIS-mf–14529, pp. 45) **Uranium-series dating of fossil bones and carbonate speleothems.** Leitner-Wild, E. (Vienna Univ. (Austria). Inst. fuer Analytische Chemie); Steffan, I. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

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Short communication. AGE ESTIMATION/fossils; FOSSILS; ALPHA SPECTROSCOPY; CARBON 14; CARBONATES; CAVES; ISOTOPE DATING; SKELETON; THORIUM; URANIUM

16153 (INIS-mf–14530, pp. 32-33) **Isolation of uranium and thorium from pure carbonate speleothems for uranium-series age determination.** Leitner-Wild, E. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Steffan, I. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/uranium; SEPARATION PROCESSES/carbonates; SEPARATION PROCESSES/thorium; SEPARATION PROCESSES/uranium; URANIUM; CALCIUM CARBONATES; CAVES; HYDROXIDES; SEDIMENTS; CARBONATES; THORIUM

16154 (INIS-mf–14530, pp. 32) **Radiocarbon dating laboratory.** Pak, E.; Vonach, W. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AGE ESTIMATION/carbon 14; AGE ESTIMATION/isotope dating; AGE ESTIMATION/laboratories; LABORATORIES; AUSTRIA

16155 (INIS-mf–14530, pp. 34-35) **Thermoluminescence dating of sediments.** Weninger, F.; Leitner-Wild, E.; Nowotny, R.; Hille, P. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THERMOLUMINESCENCE/age estimation; THERMOLUMINESCENCE/sediments; ALPHA PARTICLES; BETA PARTICLES; GAMMA RADIATION; GAMMA SPECTROSCOPY; IONIZING RADIATIONS; NATURAL RADIOACTIVITY; RADIATION DOSES; THERMOLUMINESCENCE; SEDIMENTS

16156 (IS–5116) **High resolution fiber optic interferometer: FY94 final report.** Baldwin, D.P.; Zamzow, D.S.; D'Silva, A.P. Ames Lab., IA (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010269. Source: OSTI; NTIS; INIS; GPO Dep.

Objective is a field, on-line high resolution spectrometer system capable of resolving the optical emission from actinide isotopes in an inductively coupled plasma. AOTF (acousto-optic tunable filter) and FFP (fiber optic Fabry-Perot) were combined in this spectrometer, using bulk optical materials. The AOTF-FFP system was tested on U-235/U-238 and RCRA metals. Future development is described; a commercialization plan is attached.

16157 (JAERI-Conf–94-004, pp. 100-107) **High-energy elastic recoil detection heavy ions for light element analysis.** Goppelt-Langer, P. (Japan Atomic Energy Research Inst., Takasaki, Gunma (Japan). Takasaki Radiation Chemistry Research Establishment); Yamamoto, S.; Takeshita, H.; Aoki, Y.; Naramoto, H. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. (CONF-9403189–: 1993 workshop on particle-material interactions for fusion, Tokai (Japan), 8-9 Mar 1994). In *Report of the 1993 workshop on particle-material interactions for fusion.* 195p. Order Number DE95737282. Source: OSTI; NTIS; INIS.

The detection of light and medium heavy elements in not homogeneous solids is a severe problem in ion beam analysis. Heavy elements can be detected by the well established Rutherford backscattering technique (RBS). In a homogeneous host material most impurities can be easily analyzed by secondary ion mass spectroscopy (SIMS). Some isotopes (^{3}He, ^{6}Li, ^{10}B) can be measured by nuclear reaction analysis (NRA) using thermal neutrons inducing (n, p) or (n, α) reactions. Others can be detected by energetic ion beams by nuclear reactions (e.g. ^{15}N(^{1}H, $\alpha\gamma$)^{12}C for analysis of hydrogen). A high content of H, D or T can be also determined by elastic recoil detection using an energetic He beam. The latter technique has been developed to a universal method for detection of light and heavy elements in any target, using a high energetic heavy ion beam and a detector system, which is able to identify the recoils and delivers energy and position of the particles. (author).

16158 (JINR-E–3-94-437) **Recent Development of Radioanalytical Methods at the IBR-2 Pulsed Fast Reactor.** Nazarov, V.M.; Peresedov, V.F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 24p. Order Number DE95627526. Source: OSTI; NTIS (US Sales Only); INIS.

Accepted by Organizing Committee of the Third International Conference on Methods and Applications of Radioanalytical Chemistry, Hawaii, Apr 10-16, 1994.

Experience in the application of radioanalytical methods, including NAA, at the IBR-2 pulsed fast reactor is reviewed. Details of the instruments dedicated to neutron activation analysis and radiography studies are reported. Applications of resonance neutrons to environmental monitoring and to the investigation of high-purity materials, are examplified. 15 refs. 9 figs., 9 tabs.

16159 (JINR-R–3-94-453) **Activation Analysis of High Purity Aluminium.** Klochkov, V.N.; Nazarov, V.M.; Peresedov, V.F.; Chinaeva, V.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 7p. (In Russian). Order Number DE95627527. Source: OSTI; NTIS (US Sales Only); INIS.

The content of micro impurities in super clean aluminium obtained by the melting zone method was determined by activation analysis at the IBR-2 reactor at the FLNP. Nearly of 25 elements were determined with their concentrations as lying within the 10^{-4}-10^{-9} weight %. Estimates of cleaning degree for impurity elements within the 1 up to 10^{4} have been obtained. 1 ref., 4 tabs.

16160 (JINR-R–6-94-373) **A Novel Approach to the Problem of Highly-Sensitive Regular Analyses for Man-Made Plutonium in Environment and Human Body.** Chuburkov, Yu.T.; Perelygin,

V.P.; Zvara, I.; Szeglowski, Z.; Shtan'ko, S.P.; Buklanov, G.V.; Kharitonov, Yu.P.; Belov, A.G.; Drobina, T.P.; Bugrov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 6p. (In Russian). Order Number DE95626245. Source: OSTI; NTIS (US Sales Only); INIS.

A method of determining subpicogram quantities of plutonium in soil, mud, water, plant and animal tissues is proposed. Plutonium is chemically isolated from the specimens, while the α-active ^{236}Pu is used to control the yield, and irradiated by thermal neutrons. The number of fission acts ^{239}Pu determined by solid state track detectors (SSTD). To control possible uranium impurities in the plutonium fraction, the latter and standard (in contact with fresh SSTD) are bombarded by high fluence of γ-quanta with energies $\leq$ 25 MeV (microtron Bremsstrahlung). We have succeeded in determining the lower limit of ^{235}U impurities at a level of $< 10^{-13}$ g, due to similar photofission cross section of all U and Pu isotopes. The proposed method provides the determination of ^{239}Pu content in regular analyses with a sensitivity at a level of 10^{-13} g/g. More than one hundred assays for ^{239}Pu content in specimens of above indicated media from Ukraine, Belarus, Ural region and Germany have been performed. (author). 13 refs., 1 fig., 1 tab.

16161 (LA-UR–95-966) **On-line surfactant monitoring.** Mullen, K.I. (Los Alamos National Lab., NM (United States). Chemical Science and Technology Div.); Neal, E.E.; Soran, P.D.; Smith, B. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950158–2: International forum process analytical chemistry (IFPAC), Houston, TX (United States), 22-25 Jan 1995). Order Number DE95009417. Source: OSTI; NTIS; GPO Dep.

This group has developed a process to extract metal ions from dilute aqueous solutions. The process uses water soluble polymers to complex metal ions. The metal/polymer complex is concentrated by ultrafiltration and the metals are recovered by a pH adjustment that frees the metal ions. The metal ions pass through the ultrafiltration membrane and are recovered in a concentrated form suitable for reuse. Surfactants are present in one of the target waste streams. Surfactants foul the costly ultrafiltration membranes. It was necessary to remove the surfactants before processing the waste stream. This paper discusses an on-line device the authors fabricated to monitor the process stream to assure that all the surfactant had been removed. The device is inexpensive and sensitive to very low levels of surfactants.

16162 (NAHRES–23) **Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.** International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

The document includes 10 final reports on the IAEA Co-ordinated Research Programme on Nuclear Techniques for Toxic Elements in Foodstuffs. A separate abstract was prepared for each report. Refs, figs and tabs.

16163 (NAHRES–23, pp. 5-18) **Activation analysis of toxic elements in meat and farinaceous foodstuffs of the Republic of Argentina.** Resnizky, S.M. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)); Bertini, L.M.; Moreno, M.A.; Cohen, I.M.; Videtti Piedracoba, N. de; Pla, R.R.; Gomez, C.D. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. (In Spanish). In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

As a result of the industrial and agrochemical developments, there has been an increase of the environmental pollution. Foodstuffs are one of the ways of incorporating some heavy metals or other contaminants into the human body. So, it is important to know the amount of these elements in the food consumed by the population. Our project on determination of toxic elements in meat and farinaceous food largely consumed in our country, was carried out by neutron activation analysis. Different kinds of flours and noodles were analyzed as farinaceous, and hamburgers and sausages as manufactured meat products. Specific separation methods were developed by radiochemical neutron activation analysis for As, Sb, Se, Hg and Cd. All these separations were based on precipitation or coprecipitation of the elements as sulphides. Other elements such as Fe, Br, Co, Zn, Rb, and also Se, were analyzed using instrumental neutron activation analysis. Using daily intake of analyzed foodstuffs from consumption tables and their average elemental composition, an intake of the studied elements was calculated. The values obtained for toxic elements were lower than the maximum permissible levels in Argentina. The results of this project could serve as a basis of a wider study including more foodstuffs as raw meat and will be used by other research groups. (author). 8 refs, 3 figs, 4 tabs.

16164 (NAHRES–23, pp. 19-70) **Application of neutron activation analysis and inductively coupled plasma mass spectrometry to the determination of toxic and essential elements in Australian foods.** Fardy, J.J. (ANSTO, Isotope Technology Program, Menai, NSW (Australia)); McOrist, G.D.; Farrar, Y.J.; Bowles, C.J.; Warner, I.M.; Tan Mingguang. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

Current Australian Legislation specifies the maximum permitted levels of nine toxic elements in food while the National Health and Medical Research Council (NH and MRC) has listed recommended daily intake figures for seven essential elements. This investigation examined the compliance of Australian foods with both these requirements. Australia-wide samples of representative foods from the diets of Australians were used in this study after the NH and MRC kindly permitted us to join their Market Basket (Noxious Substance) Survey. Both toxic and essential element concentrations in these foods were determined using the advanced analytical techniques of instrumental (INAA) and radiochemical neutron activation analysis (RNAA) and inductively coupled plasma mass spectrometry (ICP-MS). With very few exceptions, foods do not exceed the maximum permitted levels for toxic substances. Daily intake figures for essential elements generally lie close to the maximum recommended values listed by NH and MRC. Since another source of toxic element intake is drinking water, samples from different locations were analyzed by NAA and inductively coupled plasma atomic emission spectroscopy (ICP-AES). They were extremely low in trace elements with the exception of copper, iron, zinc and lead which approached the maximum permitted concentrations. The performance of NAA and ICP-MS for analyzing biological materials were compared. NAA cannot match the superior sensitivity for a wider range of elements obtained by ICP-MS. This has been verified for a wide range of food materials. While NAA is an inconvenient and time-consuming technique for many applications, it does not suffer from blank problems after irradiation of the sample and becomes the preferred technique where low limits of detection are required for trace concentrations in solid samples. (author). 22 refs, 27 figs, 21 tabs.

16165 (NAHRES–23, pp. 71-83) **Application of PIXE, NAA and other techniques for the determination of toxic elements in foodstuffs and drinking water in Bangladesh.** Tarafdar, S.A. (Atomic Energy Centre, Dacca (Bangladesh). Chemistry Div.); Khan, A.H.; Hadi, D.A.; Maroof, F.B.A.; Ali, M. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

An investigation was conducted on the status of trace and minor elements in some foodstuffs, meats and also drinking water in Bangladesh, using proton induced X-ray emission (PIXE), radioisotope-induced X-ray fluorescence (XRF), atomic absorption spectrophotometry (AAS) and also ion-selective electrode techniques. The elemental concentrations of K, Ca, Mn, Fe, Ni, Cu, Zn, As, Br, Rb and Sr, were determined in the samples by comparison with X-ray yield curves constructed from IAEA and NBS standard reference materials. Cadmium and zinc in the drinking water of Bangladesh was determined by AAS followed by solvent extraction

technique. The total iodine content in different types of vegetables was determined by alkali ashing followed by the ion-selective electrode technique. The results indicate that none of the food regimes and also drinking water investigated here is burdened with heavy metals beyond permissible limits. The significance of the results is discussed in relation to human health an diseases. Three IAEA (2-1, and 2-2 and 2-3) secondary reference standard samples were also analyzed for intercomparison studied using PIXE and ASV techniques. (author). 4 refs, 7 tabs.

16166 (NAHRES–23, pp. 85-111) **Application of neutron activation analysis to the monitoring of trace elements in Brazilian foodstuffs.** Vasconcellos, M.B.A. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Maihara, V.A.; Munita, C.J.A.S.; Favaro, D.I.T.; Armelin, M.J.A. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

Due to lack of data on trace element levels in Brazilian foodstuffs, nuclear analytical techniques were used to determine about twenty elements in foods samples collected from local markets of the city of Sao Paulo. Drinking water was also analyzed. The methods employed were mainly instrumental and radiochemical neutron activation analysis. In the case of the analysis of toxic elements, such as mercury, selenium, arsenic and antimony, the purely instrumental approach failed in yielding results for very low concentrations of these elements. For INAA, samples and multielemental synthetic standards were irradiated in the IEA R1 research reactor for periods of time ranging from minutes to several hours, under thermal neutron fluxes from 10^{11} to 10^{13} $n \cdot cm^{-2} \cdot s^{-1}$; after suitable cooling times, γ-ray spectra were measured using a Ge(Li) or Ge solid state detector. The RNAA approach involved the distillation of mercury and selenium in HBr medium; selenium was then reduced to the metal form with sodium metabisulphide and mercury was precipitated as sulphide with thioacetamide. For water analysis, a preconcentration procedure based on retention of several elements in a Chelex-100 resin was employed. The elements retained were Hg, Cr, Zn, Fe, Co while Se was measured in the effluent after absorption on active charcoal. The levels of the trace inorganic elements determined in the Brazilian foodstuffs analyzed were always below the levels established by the existing regulations in our country. (author). 16 refs, 18 tabs.

16167 (NAHRES–23, pp. 113-143) **Evaluation of analytical methods for the determination of toxic elements in environmental and intercomparison samples.** Iyer, R.K. (Bhabha Atomic Research Centre, Bombay (India). Environmental Chemistry Section); Krishnamoorthy, K.R.; Ramanamurthi, M. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

This report is a summary of the work carried out under Research Contract 4375/RB with the International Atomic Energy Agency as part of the Agency's co-ordinated research programme (CRP) on 'Nuclear Techniques for Toxic Elements in Foodstuffs' for the period 1986-1990. The work carried out is categorized into the following sections: (i) neutron activation analysis of trace elements in foodstuffs: evaluation of methodology; in this section, work on radiochemical and instrumental approaches for neutron activation analysis for determination of eight elements is included; the methods developed have been evaluated by the analysis of three sets of intercomparison samples of the Agency; (ii) ion-exchange preconcentration of ions in aqueous solution by multistage equilibration: the analysis of water samples for toxic trace elements often requires preconcentration of ions; a multistage equilibration technique for the preconcentration of five trace elements from solutions using Chelex-100 resin is described in this section. (author). 23 refs, 4 figs, 15 tabs.

16168 (NAHRES–23, pp. 145-156) **Determination of toxic and essential elements in foodstuffs from local market in Jakarta.** Sadjirun, S. (National Atomic Energy Agency, Jakarta (Indonesia). Center for Applications of Isotopes and Radiation). International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents data on toxic and essential elements such as As, Cd, Cr, Cu, Hg, Pb, Sb, Se, and Zn in rice, corn, bean, wheat, small green pea, vegetables, fruits, tea, coffee, sea foods, meat, chicken, intestines and associated organs, and eggs as consumed in Jakarta. As, Hg, Sb, Cr, Se, and Zn were determined using instrumental neutron activation analysis (INAA) after being irradiated at TRIGA MARK II reactor, while Cd, Cu, and Pb were determined using atomic absorption spectrometry (AAS). The results obtained were lower than the maximum permissible concentrations allowed. (author). 6 refs, 9 tabs.

16169 (NAHRES–23, pp. 157-172) **Trace and toxic elements in foodstuffs in Japan.** Muramatsu, Y. (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan)); Sumiya, M.; Yanagisawa, K.; Ohmomo, Y. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

Concentrations of trace elements in several foodstuffs collected in Japan were analyzed by neutron activation analysis (NAA), inductively-coupled plasma atomic emission spectrometry (ICP-AES) and anodic striping voltametry (ASV). The elements analyzed were as follows: Zn, Se, As, Hg, Cs, Cr, Co, Fe, Rb, Br and K by NAA; Mn, Ba, Sr, Mg, Ca, P, K, Zn, Cu and Fe by ICP-AES; and Pb, Cd, Cu and Zn by ASV. Because of the high consumption of rice in Japan, the focus of analysis was on this foodstuff. Concentrations of K, Mg, Mn, P and Zn in different polished rice samples were similar, whereas those of Br, Co, Cs, Rb and Se varied. Levels of toxic elements in polished rice were generally lower than those in other foodstuffs. The highest concentrations of As, Hg, Se and Zn were found in marine products, i.e.. Hijiki-algae (As: 59 mg/kg, dry), tuna (Hg: 1.1 mg/kg, dry), bonito (Se: 4.5 mg/kg, dry) and oysters (Zn: 350 mg/kg, dry). Dietary intakes of As, Ca, Cd, Cu, Fe, Hg, K, Mg, Mn, P, Pb, Se and Zn by Japanese were estimated by using these analytical results and published food consumption data in Japan. We have also identified the major sources of the elements in dietary intakes as follows: (a) about 90% of the As was derived from marine products (fish and seaweed); (b) about 70% of the Hg was derived from fish; (c) about 40-60% of the Cd and the Mn and 20-40% of the Zn, Cu and Mg was derived from rice; (d) selenium was mostly derived from fish, meat and eggs; (e) more than 20% of the Ca was derived from milk and milk products; (f) elements such as Fe, K, P and Pb was derived from different sorts of foodstuffs. (author). 7 refs, 1 fig., 7 tabs.

16170 (NAHRES–23, pp. 173-180) **Speciation of arsenic in water samples.** Elteren, J.T. Van (Netherlands Energy Research Foundation (ECN), Petten (Netherlands)); Das, H.A. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

Two methods are presented in this report for the determination of inorganic species of arsenic. For both methods, the parameters influencing the separations have been investigated using radiotracers. Following optimization of the methods; the applicability was tested by determining As(III) and As(V) in real water samples. The detection limit of these arsenic species in both fresh and sea water was about 0.02 μg/L. (author). 2 refs, 3 figs, 3 tabs.

16171 (NAHRES–23, pp. 181-214) **Assessment of dietary intake of trace elements through Pakistani integrated diets.** Qureshi, I.H. (Pakistan Inst. of Nuclear Science and Technology, Islamabad (Pakistan). Nuclear Chemistry Div.); Mannan, A.; Waheed, S.; Rehman, S.; Ahmad, S. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related

Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

A research study related to the determination and assessment of essential and potentially toxic trace elements in Pakistani integrated diets was undertaken at PINSTECH from 1986-90 under the International Atomic Energy Agency (IAEA) Co-ordinated Research Programme (CRP). During this period eight different integrated human diets of the residents of the Islamabad and Gujranwala were prepared by taking into consideration their respective food habits in summer and winter seasons. Instrumental as well as radiochemical neutron activation analyses in combination with the atomic absorption spectrometry were utilized for the precise and accurate determination of up to 23 elements in the diet samples. This work has helped us obtain the base line values for studying trace elements nutrition, inadequacy, imbalances and toxicity. Further, this would help, in future, to monitor the degree of contamination from foreign chemicals. The weekly dietary intake values were calculated which showed that our foods contain fairly adequate quantity of essential trace elements. The diet samples analyzed showed no contamination level to an extent to cause an adverse impact on human health. (author). 23 refs, 5 figs, 21 tabs.

16172 (NAHRES–23, pp. 215-288) **Analysis for toxic elements in food and drinking water in Thailand by neutron activation analysis.** Leelhaphunt, N. (Office of Atomic Energy for Peace, Bangkok (Thailand). Waste Disposal Div.); Chueinta, S.; Punnachaiya, M.; Chueinta, W.; Nouchpramool, S. International Atomic Energy Agency, Vienna (Austria). Section of Nutritional and Health-Related Environmental Studies. 1994. In *Nuclear techniques for toxic elements in foodstuffs. Report on an IAEA co-ordinated research programme.* 296p. Order Number DE95627528. Source: OSTI; NTIS (US Sales Only); INIS.

This paper presents the results of a research aimed at the determination of several trace elements in foodstuffs and water in Thailand. The project included the development of adequate analytical procedures for the determination of As, Cd, Cu and Zn by ion exchange chromatography; Hg and Se by a direct combustion technique; Br, Co, Fe and Mn by instrumental neutron activation analysis (INAA); Pb by flame atomic absorption spectrophotometry; and As, Co, Mn, Sb, U, V, Zn, and Cr in water samples by preconcentration on activated carbon followed by INAA. The samples analyzed comprised various kinds of vegetables, meat, poultry, beans and peas, various species of rice, fish, shellfish and other marine products. Natural and tap water samples were collected at several locations in twenty-nice provinces in Southern, Northern, North-Eastern and Central parts of Thailand. (author). 16 refs, 1 fig., 49 tabs.

16173 Detection of chlorinated aromatic compounds. Ekechukwu, A.A. To Dept. of Energy. 1993. Filed date 23 Feb 1993. U.S. Patent Application 8-022,579. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95009973. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Disclosed is a method for making a composition for measuring the concentration of chlorinated aromatic compounds in aqueous fluids, and an optical probe for use with said method. The composition comprises a hydrophobic polymer matrix, preferably polyamide, with a fluorescent indicator uniformly dispersed therein. The indicator fluoresces in the presence of the chlorinated aromatic compounds with an intensity dependent on the concentration of these compounds in the fluid of interest, such as 8-amino-2-naphthalene. The probe includes a hollow cylindrical housing that contains the composition in its distal end. The probe admits an aqueous fluid to the probe interior for exposure to the composition. An optical fiber transmits excitation light from a remote source to the composition while the indicator reacts with chlorinated aromatic compounds present in the fluid. The resulting fluorescence light signal is reflected to a second optical fiber that transmits the light to a spectrophotometer for analysis.

16174 (SAND–95-8210) **An investigation of a novel approach to elemental imaging in three dimensions.** Nichols, M.C. (Sandia National Labs., Livermore, CA (United States)); Goehner, R.P.; Tissot, R.G. Jr. Sandia National Labs., Livermore, CA (United States). Apr 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010340. Source: OSTI; NTIS; GPO Dep.

Feasibility of a radically different method of using X-ray excited X-ray fluorescence to perform two- and three-dimensional elemental imaging at the micrometer size scale was examined. The proposed new approach was investigated using both laboratory and synchrotron X-ray sources. The project was funded as a high-risk venture by the Laboratory Directed Research & Development (LDRD) program at Sandia National Laboratories. Investigations centered around the use of two different types of monochromators and a CCD detector to allow the imaging of characteristic excited X-radiation in two dimensions, one element at a time. The goal of this approach was to be able to obtain three-dimensional images in a similar way as is now possible using X-ray tomographic microscopy methods. Unfortunately, it was not possible to obtain sufficient signal using either X-ray source to warrant further study in this area, and the project was terminated. It is possible that the advent of more intense synchrotron X-ray sources could allow this technique to be used for certain restricted applications, but the results obtained here indicate that, without some further breakthrough, it is unlikely that a practical instrument could result using this approach.

16175 (UCRL-ID–120404) **Development of the indicator-photopolymer chemistries for multianalyte sensor arrays.** Healey, B.G. (Tufts Univ., Medford, MA (United States). Max Tishler Laboratory for Organic Chemistry); Chadha, S.; Walt, D.R.; Richards, J.B.; Brown, S.B.; Milanovich, F.P. Lawrence Livermore National Lab., CA (United States). Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009670. Source: OSTI; NTIS; GPO Dep.

Remediation of ground and waste water facilities requires the analysis of the pollutants. Multianalyte fiber-optic chemical sensors based on indicators have been developed, with multiple indicators immobilized at the distal end of a single imaging fiber. By coupling the imaging fibers to a charge coupled device detector, one can spatially and spectrally discriminate the multiple sensing sites and hence monitor multiple analyte concentrations simultaneously. This report describes the development of the indicator chemistry and immobilization procedures developed for pH, Al^{3+}, and hydrocarbons. A polymer matrix is used to mass transfer the analyte to the indictor.

16176 (UCRL-JC–118286) **Smart active multiwave sensing with zero background amplitude modulated probes.** Ruggiero, A.J.; Young, R.A.; Jelsma, L. Lawrence Livermore National Lab., CA (United States). Jul 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9404162–19: 1994 chemical analysis by laser interrogation of proliferation effluents (CALIOPE ITR) interim technical review, Livermore, CA (United States), 26-28 Apr 1994). Order Number DE95008813. Source: OSTI; NTIS; GPO Dep.

Recently, a new approach to multi-wavelength remote sensing has been proposed based on the generation and detection of spectral "pickets" synthesized from the frequency filtered bandwidth of a modelocked laser. Using linear array liquid crystal spatial light modulator (SLM) technology for spectral filtering permits real time grey scale control of individual picket amplitudes and phases, making it possible to independently modulate picket characteristics in the kHz to MHz regime. Due to the versatility of this approach, a whole suite of spectroscopies based on detection techniques that are similar to conventional sideband spectroscopies can be implemented. These techniques not only inherit the S/N advantages of their conventional counterparts, they can also be easily extended to simultaneous multi-wavelength operation using frequency multiplex techniques and configured for real time adaptive data acquisition. We report the laboratory demonstration and theoretical development of a new class of zero background AM modulated spectroscopic probes for differential absorption measurements. Preliminary detection sensitivities on the order of 10^{-6} can be inferred from our measurements. Application of this technique to realistic remote sensing scenarios, advantages over other modulation and

direct detection approaches, as well as the present limitations and theoretical limits to detection sensitivity will be discussed.

16177 (VW-FZL–9102/V5) **Development of a test method for determining elastomer tolerance of motor oils for fluorine-carbon elastomers (FKM).** Richter, B. (comp.). Volkswagenwerk AG, Wolfsburg (Germany). Bereich Forschung und Entwicklung. 8 Jul 1992. 34p. (In German). Order Number DE95770136. Source: OSTI; NTIS (US Sales Only).

In this study the elastomer tolerance of motor oils was examined with due consideration to thermal load. A method is presented for the task of establishing requirements on motor oils. (HW)

16178 (WAPD-T–3041) **Laboratory robotics – An automated tool for preparing ion chromatography calibration standards.** Chadwick, J.L. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-950389–1: Pittsburgh conference and exhibition on analytical chemistry and applied spectroscopy: stimulating the minds of today's and tomorrow's scientists, New Orleans, LA (United States), 5-10 Mar 1995). Order Number DE95009441. Source: OSTI; NTIS; GPO Dep.

This paper describes the use of a laboratory robot as an automated tool for preparing multi-level calibration standards for On-Line Ion Chromatography (IC) Systems. The robot is designed for preparation of up to six levels of standards, with each level containing up to eleven ionic species in aqueous solution. The robot is required to add the standards' constituents as both a liquid and solid additions and to keep a record of exactly what goes into making up every standard. Utilizing a laboratory robot to prepare calibration standards provides significant benefits to the testing environment. These benefits include: accurate and precise calibration standards in individually capped containers with preparation traceability; automated and unattended multi-specie preparation for both anion and cation analytical channels; the ability to free up a test operator from a repetitive routine and re-apply those efforts to test operations; The robot uses a single channel IC to analyze each prepared standard for specie content and concentration. Those results are later used as a measure of quality control. System requirements and configurations, robotic operations, manpower requirements, analytical verification, accuracy and precision of prepared solutions, and robotic downtime are discussed in detail.

4002 Inorganic, Organic, and Physical Chemistry

Refer also to citation(s) 14732, 14735, 14743, 14821, 15043, 15480, 15655, 15781, 16041, 16118, 16207, 16272, 16461, 16463, 16486, 17309, 17337, 17338, 17382, 17418

16179 (CTH-PUBL–93-8, pp. 26-33) **A method for analysing the gas phase in polyurethane foams.** Ramnaes, O. (Chalmers Univ. of Technology, Goeteborg (Sweden). Dept. of Chemical Environmental Science). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

The insulative properties of a polymer foam depend upon the properties of the polymer, such as cell size, density and number of closed cells, and upon the thermal conductivities of the captive cell gases. The blowing agents tend to diffuse out of and air into the foam. This diffusion leads to a change in the cell gas composition over time and a continuous increase in the thermal conductivity. It is consequently of interest to determine the cell gas composition of a foam at different times. Quantitative analyses of the cell gases can be used to study the ageing behaviour of a foam, to determine diffusion coefficients for different gases and to calculate the thermal conductivity of the foam. 16 refs, 2 figs, 1 tab

16180 (DOE/ER/13829–T1) **A study of catalysts and mechanisms in synthesis reactions. Final report.** Lunsford, J.H. Texas A and M Univ., College Station, TX (United States). Dept. of Chemistry. Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER13829. Order Number DE95010177. Source: OSTI; NTIS; GPO Dep.

During the catalytic oxidation of hydrocarbons over many metal oxides, radicals are formed on the surface and these intermediates emanate into the gas phase where they become involved in homogeneous reactions. Examples include methyl radicals formed during the oxidative coupling of methane, allyl radicals formed during the partial oxidation of propylene and hydroxyl radicals formed during the reaction of water with molecular oxygen. Higher temperatures (> 600°C) generally favor radical formation. Other factors that effect radical formation, as well as secondary reactions of the radicals with surfaces have been investigated. A matrix isolation electron spin resonance (MIESR) system and a laser-induced fluorescence (LIF) system have been used to study hydrocarbon and hydroxyl radicals, respectively. The goal of the research is to understand the role that these surface generated intermediates play in catalytic reactions, with emphasis on the partial and complete oxidation of hydrocarbons. The results will find application in the utilization of natural gas reserves in an efficient and nonpolluting manner.

16181 (IC–94/234, pp. 3) **Evolution of enantioselectivity at the liquid gas interface.** Koppenhoefer, B.; Trettin, U. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Unexpectedly, scalemic mixtures (>0% ee) show a significant discrimination during distillation. The most pronounced effects were observed for (S>R)-N-TFA-amino acid esters (valine, leucine, alanine), with differences of up to 20% ee in the fractions, as determined by GC on L- and D-Chirasil-Val. We define the kinetic enantioselectivity α_k of the phase transition on the basis of the relative rates: $\alpha_k = K_R/K_S$ where $(K_R = -\Delta[R]/[R]/\Delta t) \geq (k_S = -\Delta[S]/[S]/\Delta t)$. In contrast, a merely thermodynamic interpretation was ruled out by vapor pressure measurements: The boiling points of RS- and S-N-TFA-Val-OMe differ by no more than $\Delta T < 0.25$ deg. C, whereas thermodynamic calculations would demand for $\Delta T > 7.5$ deg. C. In the course of the distillation, a gradient of ee is built up along the column. The picture of two-dimensional homochiral domains at the liquid gas interface is corroborated by physicochemical studies in the neat liquid, including ^{1}H- and ^{13}C-NMR spectra, surface tensions and excess volumes of mixing of the enantiomers. Like in living systems, non-equilibrium effects driven by a flux of energy manifest themselves in transient local ordering of the system. (author). 1 ref., 3 figs. Abstract only.

16182 (IC–94/234, pp. 4) **Hardware and software in biology: Simultaneous origin of proteins and nucleic acids via hydrogen cyanide polymers.** Matthews, C.N. (Illinois Univ., Chicago, IL (United States). Dept. of Physics). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLYPEPTIDES/biosynthesis; AMIDINES; BIOCHEMISTRY; CYANIDES; NUCLEIC ACIDS; NUCLEOTIDES; POLYMERS; POLYPEPTIDES; BIOSYNTHESIS; PROTEINS; REACTION INTERMEDIATES; REACTION KINETICS; WATER

16183 (IC–94/234, pp. 9) **Biosynthesis of archaebacterial membrane lipids.** Oshima Tairo (Tokyo Inst. of Technology, Yokohama (Japan). Dept. of Life Science). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic

Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232--: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CELL MEMBRANES/lipids; LIPIDS/biosynthesis; BACTERIA; LIPIDS; ENZYMES; ETHERS; LABELLING; BIOSYNTHESIS; REACTION KINETICS

16184 (IC--94/234, pp. 13) **Physico-chemical basis and mechanisms for membrane formation in pre-biological environment.** Shah, D.O. (Florida Univ., Gainesville, FL (United States). Center for Surface Science and Engineering). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232--: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CELL MEMBRANES/biosynthesis; AEROSOLS; BIOLOGICAL EVOLUTION; BIOSYNTHESIS; DROPLETS; LIPIDS; MOLECULAR BIOLOGY; POLYMERS; REACTION KINETICS

16185 (IC--94/234, pp. 14) **Repetitive elements of protein sequences: Fossils of early evolution.** Simon, I. (Hungarian Academy of Sciences, Budapest (Hungary). Inst. of Enzymology); Pongor, S. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232--: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PROTEIN STRUCTURE/amino acid sequence; PROTEIN STRUCTURE/dna; AMINO ACIDS; FOSSILS; POLYPEPTIDES; DNA; PROTEINS; REACTION KINETICS

16186 (IC--94/234, pp. 26-27) **A model for the basic element of life chemistry.** Zhao Yufen (Tsinghua Univ., Beijing (China). Dept. of Chemistry); Cao Peisheng. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232--: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

A series of model compound (DAP-AA) composed of the amino acid (AA) and dialkyl phosphoryl group (DAP) is set up as the basic element of life chemistry. The self-catalysis of DAP-AA gives the self-assembly oligo-peptides in the direction of N-terminal to C-terminal, even in aqueous medium at 38 deg. C. The oligonucleotides could also be assembled from nucleosides through the assistance of DAP-AA. The DAP-AA could be the energy source as well as the phosphoryl donor for the prebiotic synthesis of biological macromolecules. A general expression for the model is proposed. (author). 1 scheme. Abstract only.

16187 (INIS-JP--028, pp. 66-68) **Synthesis of graphite intercalation compound of group VI metals and uranium hexafluorides.** Fukui, Toshihiro (Kyoto Univ. (Japan). Faculty of Engineering); Hagiwara, Rika; Ema, Keiko; Ito, Yasuhiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Systematic investigations were made on the synthesis of graphite intercalation compounds of group VI transition metals (W and Mo) and uranium hexafluorides. The reactions were performed by interacting liquid or gaseous metal hexafluorides with or without elemental fluorine at ambient temperature. The degree of intercalation of these metal fluorides depends on the formation enthalpy of fluorometallate anion from the original metal hexafluoride, as has been found for other intercalation reactions of metal fluorides. (author).

16188 (INIS-JP--028, pp. 69-70) **Synthesis and characterization of novel oxyfluorotungstates.** Katayama, Yasushi (Kyoto Univ. (Japan). Faculty of Engineering); Hagiwara, Rika; Ito, Yasuhiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Tungsten oxytetrafluoride reacts with silver fluoride in anhydrous hydrogen fluoride to form two kinds of oxyfluorotungstates, $AgWOF_5$ and $AgW_2O_2F_9$. Silver difluoride reacts to form a complex salt, $AgFW_2O_2F_9$, exhibiting tremendously strong oxidizing ability enough to oxidize Xe to Xe(II). (author).

16189 (INIS-JP--029, pp. 82-83) **Sythesis of rare earth metal - GIC graphite intercalation compound in molten chloride system.** Ito, Masafumi (Kyoto Univ. (Japan). Faculty of Engineering); Hagiwara, Rika; Ito, Yasuhiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Graphite intercalation compounds of ytterbium and neodymium have been prepared by interacting graphite and metals in molten chlorides. These rare earth metals can be suspended in molten chlorides in the presence of trichlorides via disproportionation reaction RE(0) + RE(III) = 2RE(II) at lower than 300 degC. Carbides-free compounds are obtained in these systems. (author).

16190 (INIS-JP--029, pp. 86-88) **Dynamics of vibrationally exited molecules in rare gas matrix.** Eda, Gakuzi (Kyoto Univ. (Japan). Faculty of Engineering); Mitani, Yukio; Wada, Kazuhiro. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

A krypton matrix which contains SF_6 molecules ($^{32}SF_6$: $^{34}SF_6$ = 95.02 : 4.2) is irradiated with a pulse from a TEA CO_2 laser. The ν_3 vibration of $^{32}SF_6$ can be exited by the light of 10P(30) line from the laser, while that of $^{34}SF_6$ by the 10P(48) line. When the matrix is irradiated with a pulse at a high fluence, ablation takes place, and molecules of Kr, $^{32}SF_6$ and $^{34}SF_6$ are emitted. Dynamics of molecules in rare gas matrices after laser excitation of the vibration of guest molecules. (author).

16191 (INIS-mf--14515) **Flocculation of suspended matter in a crude wet phosphoric acid (Algeria).** Brikci Nigassa, M. (Centre de Developpement des Materiaux, Dept des Procedes Chimiques, lab. de Traitement des Minerais, Algiers (Algeria)); Bensebaa, A. Centre de Developpment des Materiaux, Algiers (Algeria). Lab. de Traitement des Minerais. Nov 1994. 45p. (In French). Order Number DE95627539. Source: OSTI; NTIS (US Sales Only); INIS.

Prior to the recovery of uranium, a pre-treatment of the phosphoric acid is necessary to remove soluble impurities of different origins. In this work, synthetic flocculants have been used. the influence of operating conditions on flocculation and filtration, such as, type of flocculants, polymer concentration, temperature, mixing and time of agitation, has been studied for both aged and fresh phosphoric acid. It has been shown that synthetic flocculants can

be used for flocculation in a phosphoric acid medium and that flocculation and filtration processes are strongly linked.

16192 (LA-UR–95-795) **Base hydrolysis and hydrothermal processing of PBX-9404 explosive.** Sanchez, J.A.; Flesner, R.L.; Spontarelli, T.; Dell'Orco, P.C.; Kramer, J.F. Los Alamos National Lab., NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9503123–1: Maes national symposium and career fair, Los Angeles, CA (United States), 26-29 Mar 1995). Order Number DE95009437. Source: OSTI; NTIS; GPO Dep.

Base hydrolysis in combination with hydrothermal processing has been proposed as an environmentally acceptable alternative to open burning/open detonation for degradation and destruction of high explosives. In this report, the authors examine gaseous and aqueous products of base hydrolysis of the HMX-based plastic bonded explosive, PBX-9404. The authors also examine products from the subsequent hydrothermal treatment of the base hydrolysate. The gases produced from hydrolysis of PBX-9404 are ammonia, nitrous oxide, and nitrogen. Major aqueous products are sodium formate, acetate, nitrate, and nitrite, but not all carbon products have been identified. Hydrothermal processing of base hydrolysate destroyed up to 98% of the organic carbon in solution, and higher destruction efficiencies are possible. Major gas products detected from hydrothermal processing were nitrogen and nitrous oxide.

16193 (NREL/TP–473-7575) **Photocatalytic oxidation of gas-phase BTEX-contaminated waste streams.** Gratson, D.A.; Nimlos, M.R.; Wolfrum, E.J. National Renewable Energy Lab., Golden, CO (United States). Mar 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-950646–9: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95004058. Source: OSTI; NTIS; GPO Dep.

Researchers at the National Renewable Energy Laboratory (NREL) have been exploring heterogeneous photocatalytic oxidation (PCO) as a remediation technology for air streams contaminated with benzene, toluene, ethyl-benzene, and xylenes (BTEX). This research is a continuation of work performed on chlorinated organics. The photocatalytic oxidation of BTEX has been studied in the aqueous phase, however, a study by Turchi et al. showed a more economical system would involve stripping organic contaminants from the aqueous phase and treating the resulting gas stream. Another recent study by Turchi et al. indicated that PCO is cost competitive with such remediation technologies as activated carbon adsorption and catalytic incineration for some types of contaminated air streams. In this work we have examined the photocatalytic oxidation of benzene using ozone (0_3) as an additional oxidant. We varied the residence time in the PCO reactor, the initial concentration of the organic pollutant, and the initial ozone concentration in a single-pass reactor. Because aromatic hydrocarbons represent only a small fraction of the total hydrocarbons present in gasoline and other fuels, we also added octane to the reaction mixture to simulate the composition of air streams produced from soil-vapor-extraction or groundwater-stripping of sites contaminated with gasoline.

16194 Method for selective dehalogenation of halogenated polyaromatic compounds. Farcasiu, M.; Petrosius, S.C. To Dept. of Energy. 1993. Filed date 18 Mar 1993. U.S. Patent Application 8-033,480. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95009982. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A method for dehalogenating halogenated polyaromatic compounds is provided, wherein the polyaromatic compounds are mixed with a hydrogen donor solvent and a carbon catalyst in predetermined proportions, the mixture is maintained at a predetermined pressure, and the mixture is heated to a predetermined temperature and for a predetermined time.

16195 (UCRL-ID–119557) **CHEMSODE: A stiff ODE solver for the equations of chemical kinetics.** Aro, C.J. Lawrence Livermore National Lab., CA (United States). Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009469. Source: OSTI; NTIS; GPO Dep.

This report describes the CHEMSODE package: a collection of FORTRAN subroutines for the automatic integration of systems of ordinary differential equations (ODEs) arising in atmospheric chemical kinetics. The mathematical basis and code are presented here.

16196 (VTT-TIED–1523) **The characterization methods for colloids in aqueous solutions.** Vuorinen, U.; Kumpulainen, H. Technical Research Centre of Finland, Espoo (Finland). Nov 1993. 52p. (In Finnish). Order Number DE95627540. Source: OSTI; NTIS; INIS.

This literature review deals with characterization methods for colloids in aqueous solutions and in groundwater. The basis for the review has been the needs of nuclear waste disposal studies and methods applicable in such studies. The methods considered include non-destructive laserspectroscopic methods (e.g. TRLFS, LPAS, PALS), several separation methods (e.g. ultrafiltration, dialysis, electrophoresis, field-flow-fractionation) and also some surface analytical methods, as well as some other methods giving additional information on formation and migration properties of colloids. (au.) (71 refs., 13 figs., 3 tabs.).

4004 Electrochemistry

Refer also to citation(s) 15236, 15817

4005 Photochemistry

Refer also to citation(s) 14748, 15288, 15775

4006 Radiation Chemistry

Refer also to citation(s) 16247

16197 (BNL–61149, pp. 178-179) **Experience with the NIH ethanol water target.** Channing, M. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A water target was presented, constructed entirely of Titanium with a 30μm Titanium foil using 5mM ethanol addition and pressurization with helium. Irradiation was done with a JSW 1710 cyclotron with incident 17.5 MeV protons reduced in the entrance foil to about 16.8 MeV. Energy deposition was 1 eV/molecule. Formaldehyde was detected at 48 ppm and ethanol at 196 ppm in the product. 70% of the ethanol was degraded during irradiation, possibly due to a lower energy deposition in terms of eV/molecule. A polymer SAX membrane resin was used to remove radionuclidic and radiochemical impurities. Sparging the target water with He or O_2 gas did not alter the amount of ammonia produced in a given run by more than a few percent. Suggested improvements were to use silica based ion exchange material, and to use entrance foils thick enough to drop the beam energy below the ^{15}O threshold.

16198 (IC–94/234, pp. 10-11) **The chirality breaking in the photolysis of the leucine enantiomer and 5'CMP.** Pan Xianming (Beijing Univ., BJ (China). Dept. of Technical Physics); Wang Kongjiang; Wang Wenqing; Sheng Xiangrong; Wu Jilan. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. LEUCINE/photolysis; CHIRAL SYMMETRY; ENANTIOMORPHS; LEUCINE; PHOTOLYSIS; NUCLEOTIDES; PHOTOCHEMISTRY; RADIATION CHEMISTRY; REACTION KINETICS; SYMMETRY BREAKING

16199 (INIS-BR–3484) **Radiolytic degradation and stability of polycarbonate.** Araujo, E.S. de. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1993. 132p. (In Portuguese). Order Number DE95626351. Source: OSTI; NTIS (US Sales Only); INIS.

The radiolytic stability of polycarbonate was studied using national commercial additives, employed in the photo and thermo-oxidative stabilization of polymers. Among several additives tested only two showed the efficiency to radiolytic protection: one quencher and one radical scavenger. It was derived a linear relation that provides by slope of the straight line the degree of degradation (scissions), G, and the factors of radiolytic protection P (degree of protection) and CE (capture of energy) conferred by radioprotector additive easily. Therefore the method developed in this work (viscosity) to study the molecular degradation and stability of polymers is a simply and precise method. The synergic mixture of two additives (1% of weight total) confers at polycarbonate excellent radiolytic protection of 98% (20 - 40 kGy) reducing the G value of 16.7 to only 0.4. (author). 69 refs, 31 figs, 17 tabs.

16200 (INIS-mf–15109) **Influence of radiation treatment on pharmaceuticals and adjuvants: A literature study. Pt. 9. Supplement.** SozEp-Hefte, v. 17. Lindemann, L.; Schuettler, C.; Boegl, K.W. Bundesgesundheitsamt, Berlin (Germany). Inst. fuer Sozialmedizin und Epidemiologie. 1993. 116p. (In German). Order Number DE95769153. Source: OSTI; NTIS (US Sales Only); INIS.

Sterilization of medical aid articles (e.g. catheters, one-way syringes) with ionizing radiation is a successful practice in many countries. During recent years, the results from numerous experiments of radiosterillization of pharmaceuticals and adjuvants have likewise been published. Experience has shown that radiation treatment, in many cases, is leading to transformations of the irradiated substances. In the present part IX of the bibliographic study on the influence of radiation treatment on pharmaceuticals and adjuvants the results of experiments on ca. 80 substances from 36 different sources have been evaluated. In all parts of the study results of about 560 experiments on 360 substances from 176 different sources are present. (orig.)

16201 (OEFZS–4722) **Electron beam treatment with radical scavengers/enhancers.** Gehringer, P. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Aug 1994. 18p. Order Number DE95627557. Source: OSTI; NTIS (US Sales Only); INIS.

Also published in the Proceedings of the National Science Foundation Workshop 'Applications of Ionizing Radiation for Decontamination of Environmental Resources', Miami (Coconut Grove), Florida, 1-3 June 1994.

E-beam treatment of low level contaminated groundwater is best apt to demonstrate the role of scavengers and enhancers, respectively because groundwater already contains some scavengers as natural solutes. The action of ionizing radiation to water is known to result in the formation of ions, molecular and free radical species. For low level contaminations of groundwater (pollutant concentration < 1 ppm) just the highly reactive free radical species OH, e_{aqu} - and H are of interest for pollutant decomposition. The pollutants have to compete for the free radical species with the natural solutes. 10 figures are discussed. (author).

16202 (OEFZS–4723) **Ozone-electron beam treatment for groundwater remediation.** Gehringer, P.; Eschweiler, H.; Fiedler, H. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Aug 1994. 7p. Order Number DE95627558. Source: OSTI; NTIS (US Sales Only); INIS.

Also to be published in the Proceedings of the 9th International Meeting on Radiation Processing, September 1994, Istanbul (TR).

Dose rate effect and low penetration are major disadvantages of electron beam irradiation. Addition of ozone before or during irradiation may eliminate the dose rate effect as shown for the remediation of a groundwater contaminated with trace amounts of chlorinated solvents such as trichloroethylene (TCE) and perchloroethylene (PCE). Beside the elimination of the dose rate effect the necessary radiation dose for pollutant decomposition is considerably lowered by the presence of ozone during irradiation. As a consequence the economy of the combined ozone/irradiation process becomes better than that of irradiation alone. Irradiation of turbulent water flows enables clean-up of water layers thicker than the maximum penetration of the electrons used. This effect is improved by the presence of ozone during irradiation, too. (authors).

16203 (OEFZS–4724) **Oxidative treatment of a waste water stream from a molasses processing using ozone and advanced oxidation technologies.** Gehringer, P. (Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria)); Szinovatz, W.; Eschweiler, H.; Haberl, R. Oesterreichisches Forschungszentrum Seibersdorf GmbH (Austria). Aug 1994. 11p. Order Number DE95627559. Source: OSTI; NTIS (US Sales Only); INIS.

Also to be published in the Proceedings of the 12th Ozone World Congress and Exhibition, 15-19 May 1995, Lille (FR).

The discoloration of a biologically pretreated waste water stream from a molasses processing by ozonation and two advanced oxidation processes (O_3/H_2O_2 and O_3/γ-irradiation, respectively) was studied. Colour removal occurred with all three processes with almost the same efficiency. The main difference of the methods applied was reflected by the BOD increase during the discoloration period. By ozonation it was much higher than by AOPs but it also appeared with AOPs. AOPs were, therefore, not apt for an effective BOD control during discoloration. (authors).

16204 (PA-TR–3114) **Effects of gamma-ray irradiation on M1 propellant.** Abel, J.E. (Picatinny Arsenal, Dover, NJ (United States)); Mapes, J.E.; Levy, P.W. Picatinny Arsenal, Dover, NJ (United States). Feltman Research Labs. Apr 1964. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009506. Source: OSTI; NTIS; GPO Dep.

Samples of M1 single-base propellant were exposed to 10^5, 10^6, and 10^7r of Co^{60} gamma rays. Burning rates were determined over a pressure range of 600 to 2600 psi at -40°, 21°, and 71°C. A statistical study indicated no significant change in the burning rate and a small but statistically significant increase (6%) in the exponential factor n after the 10^7r dose. Visible deterioration resulted, as the color changed from yellow to dark brown and the surface became uneven. In view of these marked visible effects, the slight change in burning rate is surprising. One sample exposed to 5×10^8r showed severe blistering, swelling, and contraction, and embrittlement causing fracture. Nitrogen Taliani tests conducted at 110°C indicated that the decomposition rate is decreased by exposure to 10^5r, is decreased less by 10^6r, and remains unchanged after 10^7r exposure. Chemical analysis showed that the percentage of 2-nitrodiphenylamine increases with dose by a factor of 7 at 10^7r, while, at the same time, the nitrogen content of the nitrocellulose decreases with increasing dose. This indicates that a substantial part of the nitrocellulose decomposition product had reacted with the diphenylamine stabilizer. It is remarkable that propellant strands obviously modified by exposure to 10^7r showed little or no change in burning rate.

16205 (RISO-R–804(EN)) **Atmospheric chemistry of hydrofluorocarbons and hydrochlorofluorocarbons.** Sehested, J. Risoe National Lab., Roskilde (Denmark). Environmental Science and Technology Dept. Mar 1995. 207p. Order Number DE95628583. Source: OSTI; NTIS; INIS.

Pulse radiolysis coupled with a time resolved UV absorption detection system and a FTIR spectrometer coupled to a 140 l reaction chamber was used to study the degradation of HCFCs and HFCs in the atmosphere. Reaction rates for a series of reactions of HFCs and HCFCs were investigated: F + RH, R + O_2 + RO_2 + NO, and RO_2 + NO_2 + M, together with UV absorption spectra of the halogenated alkyl (R) and halogenated alkyl peroxy radicals (RO_2). The products following the self reactions for RO_2 radicals for RO_2 = $CF_3CF_2O_2$, $CF_2HCF_2O_2$, $CF_3CH_2O_2$, CFH_2CFHO_2, CF_3O_2, and $CF_3C(O)O_2$ were investigated by the FTIR setup. The results show that the self reaction of halogenated peroxy radicals give the alkoxy radical, RO, as product. The atmospheric fate of these radicals were C-C bond cleavage for CF_3CF_2O, CHF_2CF_2O,

CFH_2CHFO, and $CF_3C(O)O$; while CF_3CH_2O radicals rect with O_2 to give CF_3CHO and HO_2. the reaction between CFH_2O_2 and HO_2 was shown to give 29±7 % CH_2FCOOH and 72±11 % HCOF as the carbon containing products. (Abstract Truncated)

16206 (SKB-TR–94-15) **Modelling of nitric acid production in the Advanced Cold Process Canister due to irradiation of moist air.** Henshaw, J. (AEA Technology, Decommissioning and Waste Management/Reactor Service, Harwell (United Kingdom)). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Jan 1994. 30p. Order Number DE95626352. Source: OSTI; NTIS; INIS.

This report summarises the work performed for SKB of Sweden on the modelling of nitric acid production in the gaseous environment of the Advanced Cold Process Canister (ACPC). The model solves the simultaneous chemical rate equations describing the radiation chemistry of $He/Ar/N_2/O_2/H_2O$ gas mixture, involving over 200 chemical reactions. The amount of nitric acid produced as a function of time for typical ACPC conditions has been calculated using the model and the results reported. 11 refs, 11 figs, 1 tab.

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Refer also to citation(s) 15844, 16126, 16127, 16337, 16338, 16339, 16341, 16366, 16367, 16368, 16370, 16371, 16372, 16756, 16871, 16872, 16957, 16997

16207 (BARC–1994/E/024) **Dicyclohexano-18-crown-6 as a novel carrier in the liquid membrane permeation of actinides.** Kumar, Anil (PREFRE Plant, Tarapur (India)); Singh, R.K.; Bajpai, D.D.; Shukla, J.P. Bhabha Atomic Research Centre, Bombay (India). 1994. 48p. Order Number DE95627549. Source: OSTI; NTIS (US Sales Only); INIS.

The proven extractability and profound selectivity of dicyclohexano-18-crown-6 (DC18C6) has been exploited by selecting this crown ether as the ionophore in liquid membrane transport. Macrocycle-facilitated transport of Pu(IV) and U(VI) against their concentration gradient from aqueous nitric acid solutions across organic bulk liquid membrane (BLM) and thin-sheet supported liquid membrane (SLM) containing DC18C6 as the mobile carrier and toluene as the membrane solvent was investigated. (author). 23 refs., 9 tabs., 7 figs.

16208 (BNL–61149, pp. 69-76) **The yield of F-18 from different target designs in the $^{18}O(p,n)^{18}F$ reaction on frozen $[^{18}O]CO_2$.** Firouzbakht, M.L. (Brookhaven National Lab., Upton, NY (United States)); Schlyer, D.J.; Wolf, A.P. Brookhaven National Lab., Upton, NY (United States). 1994. DOE Contract AC02-76CH00016. Grant NINDS NS 15380. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The shortage of oxygen-18 enriched water has encouraged the authors to explore alternate methods of production of fluorine-18 where the recovery of the oxygen-18 enriched target material is extremely efficient. The authors have recently presented the results from a cryogenic target using carbon dioxide ice as the target. This is similar in design to a water ice target previously described. The amount of material required and the maximum beam current which can be put on the target are a function of the particular design. The effects of target cone length and number of cooling fins have been explored in order to optimize the target design. Three different targets have been used to test these parameters. The three targets are shown. The first was the prototype target with a single heat sink at the rear of the target. The second is a target with several cooling fins and a short cone length which requires less target material. The third is a target with several cooling fins but a longer target length which allows for more efficient cooling of the material. The results from these studies are summarized. The target with four cooling fins could be run at a beam current of 18 μA with no perceptible volatilization of the target material while the target with the single cooling block showed volatilization at about 8 μA. The long and short cone targets did not show a difference in the volatilization of the target material at the beam current limit of the 60 inches cyclotron (18 μA).

16209 (BNL–61149, pp. 77-81) **Production of ^{18}F from sodium-metal-target.** Schwarzbachs, R. (Paul Scherrer Institute, Villigen PSI (Switzerland)); Blaeuenstein, P.; Huszar, I.; Jegge, J.; Schubiger, P.A. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Fluorine-18 is produced in large scale for application in PET, mostly by the $O(p,n)^{18}F$ reaction. Looking for an alternative to this method, a reaction presented by Lagunas-Solar, which also yields ^{18}F has been examined: $^{23}Na(p,x)^{18}F$. The authors expected a much higher yield by producing ^{18}F from Na instead of ^{18}O-water due to the higher beam current. They wanted to know to which extent the more complicated process of separating ^{18}F from Na would reduce the yield due to the decay of ^{18}F. The presence of the accelerator with Ep = 72 MeV together with previous experience with a Rb metal target for ^{82}Sr production, brought about a fast development and testing of the Na target.

16210 (BNL–61149, pp. 105-118) **An investigation of aluminum alloy 6061 heat treatment and its effect on iodine absorption in Nordion gas targets.** Williams, D.R. (Nordion International, Inc., British Columbia (Canada)); Heilemann, S.; Webster, B.; Orzechowski, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The yield of I-123 from gas targets used by Nordion has been noted to vary from target to target given identical irradiation conditions and target geometries. It is suggested that changes in the microstructure occurring during welding of the aluminum 6061-T6 alloy used to make the target, may have an effect on the yield. Various samples of aluminum 6061 were heat treated to the TO, T4 and T6 conditions. The surface microstructure of representative samples were compared, including the machined surface finish as well as the grain structure of the sample. These samples were immersed in a sodium iodide solution labelled with I-123 under similar conditions as that found in the gas target during a production run. The samples were then rinsed and counted for activity remaining on their surface.

16211 (BNL–61149, pp. 126-129) **Production of long-lived radioisotopes and its application to calibration sources for PET cameras.** Gonzalez-Lepera, C. (Univ. of Pennsylvania, Philadelphia, PA (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

An internal solid target station was developed for the JSW3015 Cyclotron. Manual loading and retrieval of irradiated targets is executed with minimal operator intervention, thus reducing exposure. Preliminary results concerning the production of small amounts of the radioisotope ^{22}Na (2.6 yr. half-life) via the reaction $^{24}Mg(d,\alpha)^{22}Na$ are presented. Chemical extraction of the product from the target matrix and construction of linear sources for PET cameras is also discussed.

16212 (BNL–61149, pp. 154-159) **Overview on ammonia production.** Berridge, M. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The author reviews work concerning the production of ^{13}N ammonia. The interest in this compound stems from its use as a radiopharmaceutical.

16213 (BNL–61149, pp. 160-167) **A novel solid graphite target for the production of ^{13}N-ammonia.** Hughey, B.J. (Science Research Lab., Inc., Somerville, MA (United States)); Shefer, R.E.; Klinkowstein, R.E.; Dence, C.S.; Welch, M.J. Brookhaven National Lab., Upton, NY (United States). 1994. Grant 1R43HL48969; Grant 2R44CA53953; Contract SDI084-89-C-0049. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

This paper describes a technique for rapid and efficient in-situ extraction of ^{13}N activity from solid graphite after deuteron beam bombardment. This technique is particularly applicable to the production of ^{13}N at low bombarding energy (less than 5 MeV), and was developed for use with the 3.7 MeV Tandem Cascade Accelerator (TCA) developed at Science Research Laboratory (SRL). Use of this target at deuteron beam energies as low as 1.2 MeV has been investigated and has led to the design of an ultra-low energy ^{13}N-ammonia generator described in an accompanying paper. The various techniques used for the in-target production of ^{13}N with cyclotron beams cannot be used for isotope production at low bombarding energy because of the high thresholds of the commonly used ^{16}O(p,α)^{13}N and ^{13}C(p,n)^{13}N reactions. The ^{12}C(d,n)^{13}N nuclear reaction has a low threshold energy (0.33 MeV) and a high yield at low bombarding energy. A charcoal slurry target using this reaction has been investigated for use with a 3.5 MeV deuteron beam. However, the requirement for a foil target window with any liquid or gas phase target is incompatible with isotope production at 1.2 MeV beam energy because a large fraction of the beam energy will be deposited in the window itself. Carbon-12 in the form of solid graphite is an excellent accelerator target material. A solid graphite target can be placed directly in the accelerator vacuum beam line, thereby eliminating the need for a target window.

16214 (BNL–61149, pp. 168-170) **Production of N-13 ammonia using a solid graphite target and the ^{12}C (d,n) ^{13}N nuclear reaction.** Dence, C.S. (Washington Univ., St. Louis, MO (United States)); Welch, M.J.; Hughey, B.J.; Shefer, R.E.; Klinkowstein, R.E. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

With the appearance of new low energy accelerators dedicated to the production of short-lived isotopes, comes new approaches to the production of radiopharmaceuticals. The nuclear reaction ^{12}C(d,n)^{13}N was chosen for this study because of its low energy threshold (0.33 MeV) and therefore compatibility with these low energy accelerators. Low porosity graphite was chosen as the target material; irradiated graphite has been used since 1940 to extract N-13 for biological studies (4-8) but in most cases the activity was obtained as N-13 nitrogen. Kjeldahl digestion and microwave irradiation have also been applied to obtain N-13 ammonia. The authors studied the extraction of N-13 nitrogen from a solid graphite target after deuteron beam irradiation and heated in an atmosphere of pure oxygen, the authors identified the species formed and converted them to N-13 ammonia.

16215 (BNL–61149, pp. 171-177) **Experiences with a new high pressure water target for the production of [^{13}N] ammonia.** Gonzalez-Lepera, C. (Univ. of Pennsylvania, Philadelphia, PA (United States)); Dembowski, B.; Staub, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The authors present preliminary results on the operation of a newly designed high-pressure water-ethanol target for in-situ production of [^{13}N]ammonia. The results show some similar trends as those reported by Wieland et al. and Korsakov et al. when parameters like ethanol concentration, target pressure, beam current and irradiation dose are considered. More than 100 mCi of [^{13}N]Ammonia → 99% purity – ready for injection are routinely produced in 10 min. runs.

16216 (BNL–61149, pp. 180-182) **In-target preparation of [^{13}N]ammonia: Target design and chemistry.** Berridge, M.S.; Landmeier, B.J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Over the past several years, efforts to implement the reported methods for direct in-target production of [^{13}N]ammonia have brought interesting results. Before the most recent series of reports on dilute ethanol solutions for ammonia production, the available information concerning organic additives was not detailed; and the authors were intrigued, primarily by the regulatory advantages, by the possibilities of direct ammonia production under hydrogen pressure without the use of organic additives. Therefore the authors have explored the products given by use of hydrogen gas over a small-volume water target as a function of gas pressure and of beam dose and dose rate. The authors also investigated the effects of pressure alone by using helium or nitrogen gas to pressurize the target. The target was aluminum or copper-nickel, with a volume of 3 mL, pressurized with 1-8 atm. hydrogen and irradiated with a Scanditronix MC17 with 17 MeV protons. Beam currents to 30 μAmp for 30 min were used. The targets were designed with a gas head space over the target water to prevent water losses by bubble formation at high beam dose and to allow good contact between. the water and the hydrogen gas. The head space allowed substantially higher beam current and irradiation times to be used. Entrance foils (Havar) were chosen thick enough to drop the incident energy below the 150 production threshold, so 150 contamination was not observed.

16217 (BNL–61149, pp. 183-187) **[^{13}N]ammonia production via deuteron irradiation of buckminsterfullerene.** Bida, G. (Biomedical Research Foundation of Northwest Louisiana, Shreveport, LA (United States)); Satyamurthy, N.; Zippi, E. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The most common nuclear reactions used for the accelerator production of nitrogen-13 are graphically summarized. At present, [^{13}N]ammonia is generated in ample quantities for PET imaging purposes by the interaction of relatively energetic(6-17 MeV) protons with an oxygen-16 rich target(natural abundance water) or carbon-13 rich target. Natural abundance carbon must be used for the low energy deuteron production of ^{13}N and is the target of choice in preliminary results for ^{13}N production using 8 MeV $^{3}He^{2+}$. In some cases, the ^{13}N produced is already in the form of ammonia, while in others, the radiolabeled species must be chemically converted to ammonia. In order to meet the anticipated growth in clinical use of this important MBF tracer and to keep pace with the development of smaller, lower energy accelerators that can operate at $<$ 8 MeV incident particle energy, sufficient ^{13}N can only be readily produced with a carbon-rich target such as fullerenes.

16218 (BNL–61149, pp. 189-201) **An experimental carbon/steam stack target for in-situ production of [^{13}N]ammonia with low energy deuterons.** Morelle, J.L. (Ion Beam Applications, Louvain-la Neuve (Belgium)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Continuing investigations aimed at the production of clinically useful amounts of ^{13}N ammonia with low energy deuterons via the ^{12}C(d,n)^{13}N reaction, thin carbon foil/steam stacks were built and tested. Using 3.3 MeV deuterons, practical $^{13}NH_4^+$ saturation yields of around one mCi/μA were delivered by such systems. A few runs were also performed with a stack of woven carbon fiber

fabric and steam layers. Yields of around 2 mCi/μA were recovered in the aqueous phase.

16219 (BNL–61149, pp. 208-212) **Targetry for the ruthenium-97 and tungsten-178 (tantalum-178) production on the phasotron of JINR.** Zaitseva, N.G. (Joint Institute for Nuclear Research, Dubna (Russian Federation)); Stegailov, V.I.; Khalkin, V.A.; Shakun, N.G.; Shishjannikov, P.T. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

This paper describes recent developments of the solid target system for the production of ^{97}Ru and ^{178}W in the ^{99}Tc(p,3n)^{97}Ru and ^{181}Ta(p,4n)^{178}W reactions. Radioisotope production proceeds on the internal 50-70 MeV proton beam of JINR phasotron. The target construction, condition of the irradiation and radionuclide practical yields were searched.

16220 (BNL–61149, pp. 232-233) **Purification of ^{89}Zr using a hydroxamate column.** Meijs, W.E. (Free Univ., Amsterdam (Netherlands)); Herscheid, J.D.M.; Haisma, H.J.; Leuffen, P.J. van; Mooy, R.; Pinedo, H.M. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Positron emission tomography (PET) is the best way for non-invasive quantification of the biodistribution of radioisotope-antibody conjugates, required for dosimetric calculations for radioimmunotherapy. The positron emitter ^{89}Zr has good physical characteristics for this application. It has a relatively long half-life (t1/2 = 78.4 h) and decays for 23% by positron emission and for 77% by electron capture to ^{89}Y (stable). The total particle release per desintegration of approximately 100 keV even opens the possibility for therapeutic applications.

16221 (BNL–61149, pp. 234-242) **Nuclear data relevant to the production of ^{67}Ga: A critical comparison of excitation functions/thick target yield data for ^{67}Zn(p,n) and ^{68}Zn(p,2n) nuclear reactions.** Szelecsenyi, F. (Mount Sinai Medical Center, Miami Beach, FL (United States)); Boothe, T.E.; Tavano, E.; Plitnikas, M.; Takacs, S.; Tarkanyi, F. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The method of choice for routine production of ^{67}Ga on a low energy cyclotron is the ^{67}Zn(p,n)^{67}Ga reaction while above 20 MeV the ^{68}Zn(p,2n)^{67}Ga process results in a higher yield of gallium. To optimize the yields in a production setting it is important to know the cross sections/thick target yield data of these reactions. In spite of the large amount of experimental information on cross section/thick target yield data of the desired reactions published up to 1993, the status in some cases is not satisfactory. In the present work, the authors have compared the available cross sections/thick target yield data and have tried to resolve the most obvious discrepancies which have appeared in the literature. The authors also present an evaluated data base for the mentioned data for the ^{67}Zn(p,n)^{67}Ga and ^{68}Zn(p,2n)^{67}Ga nuclear reactions.

16222 (BNL–61149, pp. 249-260) **Detectors and transducers for target operation and automated P.E.T. chemistry.** Zeisler, S.K. (TRIUMF, British Columbia (Canada)); Ruth, T.J.; Rektor, M.P.; Gschwandtner, G.A. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Remote target operation as well as automated PET chemistry syntheses generally require feedback from the target or synthesis module to the computer control unit. Transducers such as pressure sensors and conductivity probes can be used to indicate the filling status of gas or liquid targets. Many radiopharmaceutical preparations involve the transfer of liquids containing radioactivity and the evaporation of solvents. The authors' goal was the automation of a production system for [^{18}F]-FDG consisting of a low-volume high pressure target and a synthesis module based on the TBA-HCO_3 method by means of three recently developed devices: a non-invasive bolus detector to ensure complete filling of the water target, a small pfotodiode radiation detector to monitor trapping of the ^{18}F-fluoride, on the ion exchange resin and its elution from the column, a thermistor probe to determine the endpoint of solvent evaporations from the reaction vessel. The detectors deliver a signal suitable for processing in the Optomux™ control system. They show excellent reliability and have been successfully tested in [^{18}F]-FDG, [^{18}F]-FDOPA, and [^{13}N]-NH_3 production.

16223 (BNL–61149, pp. 261-265) **A simple liquid detector for radiopharmaceutical processing systems.** Alexoff, D.L. (Brookhaven National Lab., Upton, NY (United States)); Hallaba, K.; Schlyer, D.; Ferrieri, R. Brookhaven National Lab., Upton, NY (United States). 1994. DOE Contract AC02-76CH00016. Grant NS-15380. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Sensing the presence of liquids in tubing and vessels in radiochemical processing equipment provides information important to the remote or automatic control of the production of clinical doses of radiopharmaceuticals. Although modern commercial automated radiopharmaceutical synthesis machines do not usually include liquid presence as a measured process variable, earlier more complex automated synthesis devices did; and the inclusion of such feedback can increase system reliability and simplify troubleshooting tasks carried out by computer software or human operators. Commercial liquid level detectors are often designed for large-scale industrial processes and are therefore too large or expensive to be useful in many radiochemical hardware systems. An inexpensive miniature optical liquid detector originally by Kramer and Fuchs has been duplicated here for use in monitoring the presence of liquids in teflon tubing (1/16 in. O.D.) in an enriched oxygen-18 water recovery system.

16224 (BNL–61149, pp. 271-273) **Solvent vapor sensor & bolus detector for radiosynthesis.** Ducret, A. (CERMEP, Lyon (France)); Veyre, L.; Landais, P.; Le Bars, D. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

One of the key points in the Hamacher method of [^{18}F]FDG synthesis, in common with many other chemical reactions, is the need for an anhydrous state of the ^{18}F/Kryptofix complex before addition of the mannose triflate. This is usually done by ensuring enough time elapses after the additions of acetonitrile for azeotropic distillation of the carbonate/K 2.2.2 solution, with the resulting possibility of overheating the dry kryptofix adduct. In this system, the entire [^{18}F]FDG synthesis is controlled by a Siemens Simatic S100 PLC; the fluorination takes place in an open Sigradur® vessel. The authors choose to automate this evaporation step with the control of this little vapor sensor, used otherwise to detect explosive atmospheres. The sensor is based on a miniature flammable gas sensor designed for detection of propane, butane, natural and "town" gas, using the platinum wire (pellistor) principle. Acetonitrile and organic flammable solvents are easily detected, the difference ($\sim$ 30 mV) between the platinum sensing filament and compensating filament is measured and drives a K relay interfacing the Simatic PLC. Response time is within 3 seconds after complete disappearance of the solvent.

16225 (BNL–61149, pp. 274-275) **Sensors for indication of evaporation of solvents: Experience at the Univ. of Washington.** Link, J. (Univ. of Washington, Seattle, WA (United States)); Krohn, K.; Courter, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop

on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The authors have been developing sensors for indicating dryness and solvent removal in robotic syntheses. Initially, the robotic arm would hold up the reaction vessel and the operator would observe the sample through lead windows, but it was soon realized that looking dry, wasn't dry. Hence, the authors are investigating other types of sensors for indicating solvent removal. One sensor examined involves conductivity. One sensor design was comprised of two steel or Pt wires sheathed in fused silica capillaries to electrically isolate them from each other, with less than 0.05 cm of wire exposed to the reaction mix in the reaction vessel. The authors measured the change in resistance during drying. It was hypothesized that resistance would increase as the reaction became dry and become infinite when all solvent was removed. A water/CH_3CN mixture at 96°C was dried with argon blowing over it. The conductivity changed with drying as shown, but not the way expected. The technique was not very sensitive. The measured resistance went to 0 and then negative as the solvent disappeared. Also there is the disadvantage of having a probe in contact with the sample, which caused loss of sample due to dried solids staying on the surface of the probe and the potential for contaminating the reaction. A thermocouple sensor is currently being evaluated in the synthesis of thymidine.

16226 (BNL–61149, pp. 276-283) **An efficient system for the preparation of [^{11}C]-HCN, CO_2 and CO.** Dahl, J.R. (Cornell Univ. Medical College, Manhasset, NY (United States)); Matacchieri, R.A.; Belakhlef, A.; Chaly, T.C.; Margouleff, D. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A number of systems for the routine preparation of the [^{11}C]-labeling precursor compounds have been reported and a number of systems are commercially available which satisfy these requirements with varying degrees of success. Local conditions and techniques often impose new requirements not discernible during the design of a commercial system. Such was the case with the ^{11}C system at North Shore University Hospital. As supplied, this system was operated remotely by selecting a flow path by means of toggle switches on a control panel. A dummy diagram assisted in selection of the path and appropriate operation of the toggle switches. Skilled, experienced chemists left undisturbed and allowed to concentrate on the task could, with practice, operate the system effectively. However, inappropriate switching of the flow path could easily cause reagents to be sucked into the system, usually with the result that a run was lost and the system rendered inoperative until repaired. To improve reliability and increase ease of operation, the system was redesigned, taking advantage of the opportunity to increase system automation as much as possible. Since the automatically controlled functions on the MC17F cyclotron and associated systems are controlled through programmable logic controllers (PLC's) it was decided to continue with this method rather than instituting a dedicated micro-computer with interface boards.

16227 (BNL–61149, pp. 294-297) **Synthetic application of column extraction to automated preparations of PET radiopharmaceuticals.** Iwata, Ren (CYRIC Tohoku Univ., Sendai (Japan)); Ido, Tatsuo. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Organic synthesis generally requires extraction for purification of a reaction product. In PET radiochemistry this liquid-liquid extraction has often been conveniently substituted for solid phase extraction with a commercially available short C18 column to accommodate a procedure to remote control or automation. However, this replacement cannot be applied to all PET radiopharmaceutical preparations, and consequently conventional liquid-liquid extraction is sometimes inevitably employed using a specially designed device to automate this procedure.

16228 (BNL–61149, pp. 308-311) **Presentation of the FDG microlab.** Koziorowski, J. (GEMS PET Systems AB, Uppsala (Sweden)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The initial report on the MicroLab was presented at the IVth target workshop at PSI, Switzerland in 1991. It was a technical description and a presentation of the specifications, yet no experimental data were presented. This presentation is based on data and experience from the clinical sites and is therefore an experimental data presentation and not a product specification. The synthesis is, based on the solid-phase Mulholland method. The yield and radiochemical purity depends on the quality (purity) of the target water. The nature of the target water impurities is, at the time being, not known.

16229 (BNL–61149, pp. 312-318) **Advances in the robotic production of radiopharmaceuticals.** Gaehle, G. (Washington Univ. School of Medicine, St. Louis, MO (United States)); Welch, M.J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A variety of robotic systems, including Zymark, Hudson Control Group, Anotech, and Questech formerly U.M.I, have been used as a reliable and safe way to produce radiopharmaceuticals. A robotic system's ability allows it to produce a variety of radiopharmaceuticals on a routine basis including final preparation and quality control. With proper scheduling, a single robotic system can synthesize ^{18}F-fluorodeoxyglucose, ^{18}F-estradiol, ^{11}C-acetate, ^{68}Ga-citrate and at the same time control black box type syntheses such as ^{15}O-butanol in a single day. A robotic system's flexibility allows it to be used in designing and testing new syntheses, thus making the development of the new radiopharmaceuticals safer for the chemist. The development of Windows, a multi-tasking operating system for PC computers, allows a robot controlled by that computer to function simultaneously with a large variety of other systems. This increases the system's ability to communicate with other systems and it allows for change without replacing the entire system. Improvements in robot technology has increased their reliability while making them competitive in price to other means of automation. Today a robotic system to produce ^{18}F-fluorodeoxyglucose can cost as little as $55,000 U.S. depending on the cost of the hot cell.

16230 (BNL–61149, pp. 335) **Experience with the IBA automated chemistry systems.** Toorongian, S. (State Univ. of New York, Buffalo, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A presentation by the author concerning the IBA chemistry systems precipitated this question and answer session. Comments centered on the production of fluorine 18 and labelled FDG.

16231 (BNL–61149, pp. 339-343) **PET - radiopharmaceutical facilities at Washington University Medical School - an overview.** Dence, C.S. (Washington Univ., St. Louis, MO (United States)); Welch, M.J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The PET program at Washington University has evolved over more than three decades of research and development in the use of positron-emitting isotopes in medicine and biology. In 1962 the installation of the first hospital cyclotron in the USA was accomplished. This first machine was an Allis Chalmers (AC) cyclotron and it was operated until July, 1990. Simultaneously with this cyclotron the authors also ran a Cyclotron Corporation (TCC) CS-15 cyclotron that was purchased in 1977. Both of these cyclotrons were maintained in-house and operated with a relatively small downtime (approximately 3.5%). After the dismantling of the AC machine in 1990, a Japanese Steel Works 16/8 (JSW-16/8) cyclotron was installed in the vault. Whereas the AC cyclotron could only accelerate deuterons (6.2 MeV), the JSW - 16/8 machine can accelerate both protons and deuterons, so all of the radiopharmaceuticals can be produced on either of the two presently owned accelerators. At the end of May 1993, the medical school installed the first clinical Tandem Cascade Accelerator (TCA) a collaboration with Science Research Laboratories (SRL) of Somerville, MA. Preliminary target testing, design and development are presently under way. In 1973, the University installed the first operational PETT device in the country, and at present there is a large basic science and clinical research program involving more than a hundred staff in nuclear medicine, radiation sciences, neurology, neurosurgery, psychiatry, cardiology, pulmonary medicine, oncology, and surgery.

16232 (BNL–61149, pp. 344-346) **Radioisotope production at JYFL Accelerator Laboratory in Finland.** Kumpulainen, J. (MAP Medical Technologies, Inc., Tikkakoski (Finland)); Hiltunen, J.; Aeystoe, J.; Julin, R.; Liukkonen, E.; Nieminen, V.; Poikolainen, T. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

MAP Medical Technologies Inc. is a private, research oriented high-tech company, which produces radiopharmaceuticals for both diagnostic and therapeutical purposes. MAP has one nuclear reactor and one high-energy cyclotron at its disposal for research and production. The new production plant was completed in 1992, which was specially designed to fulfil the highest new requirements and standards for production and products. High-energy machines, like the new K130-cyclotron in the University of Jyvaeskylae, have a great potential for producing some special radioisotopes. Thus a solid target station for radioisotope production was planned into the new accelerator laboratory in collaboration between the Department of Physics (JYFL) and MAP. The target station is designed for high-energy intensive light-ion beams delivered from the K130-cyclotron.

16233 (BNL–61149, pp. 347-352) **A new radioisotope - production research facility utilizing ion beams from AVF cyclotron.** Sekine, T. (Japan Atomic Energy Research Institute, Takasaki (Japan)); Matsuoka, H.; Shigeta, N.; Koizumi, M.; Osa, A.; Izumo, M.; Kobayashi, K.; Hashimoto, K.; Hatsukawa, Y. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

At the Takasaki-site of JAERI, an AVF cyclotron has been constructed for advanced radiation technology research. From the cyclotron equipped with a multicusp ion source and ECR ion sources, beams of light ions and heavy ions are available for production of a broad range of radioisotopes. A radioisotope production facility utilizing these ion beams has been constructed for research and development of potentially useful radioisotopes. At the Tokai site, JAERI has nuclear reactors and a tandem accelerator. Using the reactors, JAERI has established production techniques of various radioisotopes and supplied products across Japan for medical, industrial and scientific use. As to isotopes to be produced by charged-particle reactions, production methods have been developed for isotopes such as ^{95m}Tc and ^{237}Pu which are used as tracer in research of the technetium and plutonium behavior in the nuclear fuel cycle and the environment. At the Takasaki site, production methods will be developed for potentially useful radioisotopes mainly in medicine and life science. For this purpose, solid, gas and liquids targets must be irradiated and chemically processed to produce the isotopes of light and heavy elements and their labelled compounds. The Takasaki facility consists of an irradiation apparatus, a solid-target transfer system, shielded cells for solid target and shielded cells for labelled-compound synthesis with gas and liquid targets.

16234 (BNL–61149, pp. 359) **Utilization of the CS-30 cyclotron at the Duke University Medical Center.** Wieland, B.W. (Duke Univ., Durham, NC (United States)); McKinney, C.J.; Dailey, M.F. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Present routine radionuclide production includes ^{18}F fluoride from protons on ^{18}O water, ^{13}N ammonia from protons on ^{13}C slurry, ^{15}O water from deuterons on nitrogen gas, and ^{211}At from alphas on bismuth metal. Clinical PET using two tomographs (GE 4096 and Advance) is done Tuesday through Friday, typically 4 to 11 patients per day using ^{15}O water, ^{13}N ammonia, and ^{18}F FDG synthesized with a GE Microlab. Clinical patient studies are 50% neurology using FDG, 45% body using FDG, and 5% cardiology using ammonia and FDG (oncology in these three areas totals 60%). ^{15}O water for clinical research patients (THC and cognitive) is produced twice a week. ^{211}At is produced about twice a week for monoclonal antibody labelling.

16235 (BNL–61149, pp. 360-363) **Production of ^{55}Co for positron emission tomography.** Dahl, J.R. (Cornell Univ. Medical College, Manhasset, NY (United States)); Pan, J.; Matacchieri, R.A.; Belkhlef, A.; Margouleff, D. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Cobalt-55 is a radioisotope of cobalt which decays with a 17.5 hour half life, 77% by positron emission and the remainder by electron capture. A number of other gamma photons are emitted during each decay event. It may fill the need for a positron emitting tracer for labeling compounds of medical and biological interest with a radionuclide with a half-life longer than that offered by the commonly used positron emitting radionuclides, ^{11}C, ^{13}N, ^{15}O, and ^{18}F. It provides the opportunity to use very high specific activity radioactive divalent cations to visualize nerve cell degeneration in the brain without sacrifice of the subject. A second factor which generates interest in ^{55}Co is that Co^{++} ion mimics Ca^{++} ion in certain neuronal tissue, providing the opportunity to investigate Ca^{++} kinetics in degenerating brain tissue without sacrifice of experimental animals. A third source of interest is the one that stimulated modern interest in ^{55}Co: when substituted for ^{57}Co as the label in radio labeled bleomycin, this important and widely used tumor scanning agent becomes even more important for similar studies using PET. Published calculations comparing the internal radiation dose from 1 micro-curie of ^{55}Co and of ^{57}Co indicate the dose is strongly dependent upon the biological half-life, and the dose from ^{55}Co will be comparable to that of ^{57}Co. The objectives of this project are the development of a method for the routine preparation of ^{55}Co via the ^{54}Fe(d,n)^{55}Co nuclear reaction, using a small medical cyclotron, and to investigate its utility as a radiotracer for positron emission tomography (PET).

16236 (BNL–61149, pp. 365-370) **Present status and prospects of production of radioisotopes with high radiochemical purity on the FLNR accelerators.** Dmitriev, S.N. (Joint Institute for Nuclear Research, Moscow (Russian Federation)); Gulbekyan, G.G.; Oganessian, Yu.Ts. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY

(United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The purpose of the FLNR work on radioisotopes is: (1) support of nuclear physical and radiochemical research, such as synthesis of transfermium elements and study of their chemical properties; (2) production of radioisotopes for special medical, biomedical and ecological research. The Laboratory has three operating accelerators: two heavy ion cyclotrons U-400 and U-200 and one compact electron accelerator - microtron MT-25. For the production of radioisotopes in the reactions, n and n, the authors use a compact electron accelerator MT-25. The main parameters of this machine are presented.

16237 (BNL–61149, pp. 371-376) **Establishment of an European Astatine Collaboration.** Weinreich, R. (Universitaet Zuerich (Switzerland)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

^{211}At is an extremely radiotoxic nuclide. It decays with a half-life of 7.2 hrs by emission of (on average) one α-particle and a number of Auger and Coster-Kronig electrons per decay. The maximum range of the a-particles is 80 μm, consequently a few cell diameters. In the last years, the general interest in astatine labelled compounds for radionuclide therapy has been reinforced: studies of the radiobiological behaviour of ^{211}At in cell culture-experiments confirmed clearly its usefulness for radiotherapeutic applications. Astatine compounds have been found which are relatively stable and useful as linkers between the nuclide and carrier proteins. A clinical study using ^{211}At-Methylene blue as radiotoxic substance as well as tumour-seeking ligand is now under consideration. On the other hand, the low availability of the nuclide is still the most important limitation for a broader clinical application: for production of this nuclide, α-particles of 28 MeV are needed. These particles are mostly generated in medium-energy multi-particle accelerators of variable energy. Such accelerators, however, are generally used by different research groups with different research aims and consequently different beamtime modes.

16238 (IAERU–9304, pp. 1-8) **From trace chemistry to single atom chemistry.** Adloff, J.P. (Strasbourg-1 Univ., 67 (France)). Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms*. 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

Hot atom chemistry in the vast majority of experimental works deals with the trace amount of radioactive matters. Accordingly, the concept of trace chemistry is at the heart of hot atom chemistry. Some aspects of the chemistry at trace scale and at subtrace scale are presented together with the related problems of speciation and the complication which may arise due to the formation of radio colloids. The examples of ^{127}I(n,γ)^{128}I and ^{132}Te (β^-)^{132}I are shown, and the method based on radioactivity was used. The procedure of separating the elements in pitchblende is shown as the example of the chemistry of traces. $_{13}{}^{27}Al+_{2}{}^{4}He\rightarrow_{0}{}^{1}n+_{15}{}^{30}P$ and $_{15}{}^{30}P\rightarrow_{14}{}^{30}Si+e^{+}+V$ are shown, and how to recognize the presence of radioactive colloids is explained. The formation of radiocolloids is by the sorption of a trace radioelement on preexisting colloidal impurity or the self-condensation of monomeric species. The temporal parameters of the nature of reactions at trace concentration are listed. The examples of Class A and Class B reactions are shown. The kinetics of reactions at trace level, radon concentration, anthropogenic Pu and natural Pu in environment, the behavior of Pu atoms and so on are described. (K.I.).

16239 (IAERU–9304, pp. 32-42) **Primary processes and ionic reactions in the chemistry of recoiling silicon atoms.** Gaspar, P.P. (Washington Univ., St. Louis, MO (United States). Dept. of Chemistry); Garmestani, K.; Boo, B.H.; Stewart, G.W. Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms*. 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

Hot atom chemistry has permitted the elucidation of the chemistry of free atoms, and these include the polyvalent atoms of refractory group 14 elements, that is, carbon, silicon and germanium. Since no more than two bonds are formed normally in a single reactive collision of free atoms, the study on the chemistry of atoms like C, Si and Ge that require the formation of more than two bonds to saturate their chemical valence necessarily involves the study of reactive intermediates. By the studies on the chemistry of recoiling ^{31}Si atoms, the mechanistic conclusions reached are reported. The most important unanswered questions concerning the reaction of recoiling ^{31}Si atoms in the systems are shown, and progress has been made toward the answering. By using tetramethyl silane as a trapping agent for silicon ions, it has been established that the reaction of ^{31}Si ions contributes significantly to the formation of products in recoil systems. The studies by various researchers on this theme are reported. (K.I.).

16240 (IAERU–9304, pp. 45-50) **Hot atom chemistry of astatine and some remarks on cage reactions.** Berei, K. (Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics); Vasaros, L. Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms*. 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

Systematic studies have been carried out on the hot replacement reaction of astatine originating from nuclear transformation. A mixture of neutron-deficient noble gas isotopes was able to be obtained as the spallation products by bombarding metallic thorium or uranium with 660 MeV protons in a synchrocyclotron. The isolation of radon isotopes from this mixture is easily performed by gas chromatography using molecular sieves. The longest lived radon isotope, ^{211}Rn (14.6h), purified and filled into ampoules containing organic compounds decomposes partly by EC and serves as a source of recoil ^{211}At reacting in situ. The reaction of recoil ^{211}At with benzene and its monosubstituted derivatives in gaseous, liquid and solid phase leads to replacement products with considerable yields. An example of isomer distribution if recoil ^{211}At replaces hydrogen atoms in aniline, chlorobenzene or nitrobenzen is shown. The halogen replacement by recoil astatine in monohalobenzene, the experiment with binary mixtures of chlorobenzene and its substituted derivatives, and three types of radical interactions concerning cage reactions are described. (K.I.).

16241 (IAERU–9304, pp. 55-62) **Stereo organic halogen hot atom chemistry. Present solutions, future projects.** Rack, E.P. (Nebraska Univ., Lincoln, NE (United States). Dept. of Chemistry); Kingsbury, C.; Ferrieri, R.A.; Wolf, A.P. Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms*. 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

Regarding the two-decade joint venture between the University of Nebraska and Brookhaven National Laboratory, an overview of the major accomplishments, their relevance to physical organic chemistry and future projects is presented. Stereoorganic halogen hot atom chemistry can provide insight into the mechanistic aspects or dynamics of gas phase hot atom reaction. The hot atoms studied were recoil ^{18}F, ^{34m}Cl and ^{75}Br generated by cyclotron irradiation and ^{38}Cl by nuclear reactor irradiation. The target molecules were enantiomeric 2-halopropionyl halides and diastereomeric dihalobutanes. For both targets, the effects of rare gas moderators on both percents of retention and inversion of configuration and their absolute yields were studied. This work leads to the postulate that substitution can occur by one of two direct replacement mechanisms. The net inversion of configuration was observed by using ^{75}Br and ^{34m}Cl as the displacing agent, and the predominant retention of configuration was found when ^{18}F was

used. In order to assist the determination of the conformational effects of hot atom reaction, molecular mechanics calculation was performed. The papers published by this project are listed. (K.I.).

16242 (IAERU–9304, pp. 63-78) **Annealing studies and exchange reactions.** Collins, C.H. (Universidade Estadual de Campinas, SP (Brazil). Inst. de Quimica). Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms.* 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

The relative values of nuclear recoil energy and bond energy are such that it is reasonable to expect the rupture of practically all the chemical bonds of the molecules in which the nuclear transformation occurs. The case of crystalline solids is mentioned, and annealing reaction is explained. Annealing reaction is induced by various causes, and the extent of annealing is related to the nature of crystal lattice. Low temperature thermal annealing processes often occur at distinct temperature intervals, suggesting a series of reactions of different, possibly discrete activation energies. At higher temperature, the annealing processes involving recoil atoms closely resemble the reactions which occur in the solids being doped. Since doping procedure introduces the radioactive species into very different chemical environment, the annealing reaction is considered to be insensitive to the exact nature of the annealing site, and reflects such bulk properties of the crystal as crystalline defects and dislocations. The variety of substrates which show the annealing reactions of recoil atoms or of dopant atoms suggest that no single model or mechanism suffices. There are many possibilities for describing such reactions. (K.I.).

16243 (IAERU–9304, pp. 79-96) **Hot atom chemistry of mixed crystals. 35 years of research.** Mueller, H. (Freiburg Univ. (Germany)). Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms.* 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

When this contribution was prepared, the author decided to present the more personal aspects of his work and the concepts that directed him. Since the time when the author interested in solid state hot atom chemistry more than 30 years ago, still now the generally accepted theory has not been existed. The irradiation test by using the BEPO pile in Harwell is reported. The use of glass fiber paper instead of cellulose paper was investigated. The real problem of the different models of primary retention should be solved. The idea of mixed crystal systems was the result of an experimental accident. The attempt of preparing mixed crystals, the papers that the author has written, the procedures of the experiment such as electrophoresis, the results of the electrophoretic separation are discussed. The next step was obviously the investigation of the ligand recoil. The production of the transient ligand vacancy complexes and their final fate resulted in mixed hexachlorobromometallate species is shown for the system $K_2O_sCl_6$-$K_2O_sBr_6(n,\gamma)^{38}Cl$. The reaction of the ^{38}Cl, the information about recoil atom reactions which increased with the complexity of target substances, and the resulted informations are reported. (K.I.)71 refs.

16244 (IAERU–9304, pp. 99-112) **Molecular beam studies and hot atom chemistry.** Continetti, R.E. (California Univ., San Diego, La Jolla, CA (United States). Dept. of Chemistry); Lee, Y.T. Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms.* 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

The application of the crossed molecular beam technique to the study of hot atom chemistry has provided significant insights into the dynamics of hot atom reaction. To illustrate this, two recent studies are discussed. Those are the study on the influence of translational energy in 0.6 to 1.5 eV range on endoergic reaction, and the experimental study on the detailed dynamics of elementary reaction at translational energy of 0.53 and 1.01 eV. The first example illustrates the contribution that molecular beam experiment can make in the understanding of the dynamics of endoergic substitution reaction. The second example illustrates the role that such studies can play in evaluating exact three-dimensional quantum scattering calculation and ab initio potential energy surfaces for chemical reaction. In the case of endoergic reaction of halogen substitution, it was observed that the reactive collision involved short lived collision complexes. It is suggested that energetic effect alone cannot account for the difference in cross sections, and dynamic effect most play a large role. In atom-diatom reaction, the differential cross section measurement of $D+H_2 \rightarrow DH+H$ reaction was carried out, and the results are discussed. (K.I.).

16245 (IAERU–9304, pp. 155-166) **Remarks on theoretical hot-atom chemistry.** Inokuti, Mitio (Argonne National Lab., IL (United States)). Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms.* 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

The publication of the 'Handbook of Hot Atom Chemistry', following the earlier volume 'Recent Trend and Application', was a major milestone in physical chemistry. Theoretical treatments of hot atom chemistry must address two classes of problems. The first class concerns the individual collisions of hot atoms with other atoms or molecules. The second class concerns the description of the consequences of the many collisions of hot atoms and their chemical environment. Most of the remarks pertain to the problems of the first class. The central issue is the adiabaticity of nuclear motions versus electronic motions. To be precise, any atomic core motion should be mentioned rather than pure nuclear motion, because tightly bound core electrons are largely irrelevant to the chemistry. When nuclear motions are sufficiently slow, or for other reasons that can be regarded as adiabatic, the collision problem is basically straightforward, therefore, interatomic and intermolecular forces can be assumed, and their consequences for nuclear motions are calculable in principle. In the case of non-adiabaticity being important, much more difficult problems arise, and it is briefly discussed, and the work by Phelps is cited. (K.I.).

16246 (IAERU–9304, pp. 187-195) **Hot atom chemistry and radwaste disposal.** Adloff, J.A. (Strasbourg-1 Univ., 67 (France)). Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms.* 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

The recoil effects accompanying the α decay of radionuclides led to the discovery of several radioisotopes, and have been utilized for the separation of radioelements in carrier-free state. On a much larger scale, α-recoil effects are operative in nature, and they are the origin of the disruption of the radioactive equilibrium between the members of natural radioactive series. In α decay, the recoil atoms cause considerable recoil damage, and the ultimate fate of the recoil atoms depends on the thermal chemical reactions which in particular determine the final oxidation state. Hot atom chemistry can help to elucidate the oxidation state of actinide daughters, and to understand the role of media and of the induced radiation damage. These factors determine the leachability and subsequently the migration behavior of the actinide and fission products. The disposal of radwaste may be more appropriate by reducing media than the case of usual matrices of ceramics or glassy material. Useful guidelines were provided by natural events and hot atom chemistry experiments conducted in the laboratory. (K.I.).

16247 (IAERU–9304, pp. 205-215) **Role of charged states in hot atom and radiation chemistry processes.** Arnikar, H.J. (Poona Univ., Pune (India). Dept. of Chemistry). Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). In *Proceedings of the international seminar on the chemistry of high energy atoms.* 270p. Order Number DE95709895. Source: OSTI; NTIS; INIS.

The primary processes of excitation and ionization of hot atoms in nuclear decay may arise due to the recoil energy they receive at the birth, the outward cascading of the vacancy initially created in the inner shells of atoms, or the shake-off of orbital electron cloud during the perturbation due to the sudden change in the nuclear charge. The present interest is limited to the role of the shake-off process in (n,γ) reactions mainly in condensed systems. The emission or absorption of a nuclear particle or a photon in nuclear process causes the marked effects in the parent atom and in the entire molecule. It was shown that the probability of excitation or ionization of recoil atoms due to shake-off was much greater than that due to the direct collision of an escaping nucleon and an orbital electron. As to the collection of charged products of nuclear reactions, the earlier works in gas phase and the formation of negatively charged species are described. The isotope effect in the overall formation and collection of charged species, the reaction in condensed phase, the later works on the formation of charged species in (n,γ) reactions, quasi-free electrons in nuclear liquids and charged species in sputtering under neutron impact are reported. (K.I.).

16248 (INEL–94/00051) **Development of proposed free release criteria for Idaho National Engineering Laboratory lead.** Losinski, S.J. (EG and G Idaho, Inc., Idaho Falls, ID (United States)). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-941214–7: 16. US Department of Energy low-level radioactive waste management conference, Phoenix, AZ (United States), 13-15 Dec 1994). Order Number DE95008617. Source: OSTI; NTIS; INIS; GPO Dep.

The INEL Lead Management Project (LMP) performed an investigation of the origin of lead used as shielding at the INEL and developed radiological profile information that was then used to establish a baseline for the DOE "no-rad-added" standard. Primary findings of the investigation include the following: (a) Much of the lead at the INEL was obtained from a DOE lead bank; (b) Lead inventory at the DOE lead bank was derived primarily from recycled sources and was most likely in the form of pure lead; (c) Secondary lead (lead from recycled sources), available in today's market, is expected to have radiological characteristics similar to those of the DOE lead bank; (d) Highly sensitive radiological testing of 20 samples of lead from secondary sources revealed the lead to be radiologically pristine. Beta-, gamma-, and alpha-emitting radionuclide concentrations were all found to be less than detectable, except for a very small quantity of lead-210 (an alpha emitter), which is a naturally occurring isotope of lead. Based on the pristine nature of lead, a proposed free release criterion for lead was developed based on a statistical null hypothesis approach. The free release criterion compares the natural background count of a clean lead standard with the natural background count of a sample. When the sample background count cannot be distinguished as different from the standard background count at the 95% confidence level, then the sample is considered radiologically clean.

16249 (INIS-JP–029, pp. 75-77) **Study on nuclear pyrochemical processing.** Miyashita, Yousuke (Kyoto Univ. (Japan). Faculty of Engineering); Magari, Tadashi; Nagae, Teruhito; Moritani, Kimikazu; Ito, Yasuhiko; Moriyama, Hirotake. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

In support of the development of pyrochemical group partitioning of radioactive wastes, the equilibrium distributions of actinides and lanthanides were measured in the binary phase systems of molten salt and liquid metal. In order to know the effect of the salt phase on the separation factors, Zn was selected for the metal phase, and LiCl-KCl and LiF-BeF_2 were examined for the salt phase. The extractabilities of actinides and lanthanides in the LiCl-KCl/Zn system was observed to be much higher than those in the LiF-BeF_2/Zn. However, no major differences in the separation factors of actinides and lanthanides were observed. (author).

16250 (SINS–2147/2) **Model calculations of ^{111}In production via the ^{112,114,115,116,117}Sn(^{1}H, xnypzα)^{111}Sb → ^{111}Sn → ^{111}In reactions.** Rurarz, E. (Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland)); Mikolajewski, S. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). May 1993. 20p. Order Number DE95628577. Source: OSTI; NTIS; INIS.

The possibility of production of no-carrier-added ^{111}In from its grandparent ^{111}Sb via ^{112,114,115,116,117}Sn (^{1}H,xn) ^{111}Sb → ^{111}Sn → ^{111}In reactions and from its parent ^{111}Sn via the ^{112,114,115,116,117}Sn (^{1}H,pxn) ^{111}Sn → ^{111}In reaction is presented here. In addition, production of ^{111}In directly via the ^{112,114,115,116}Sn (^{1}H, αxn ^{2}pxn) ^{111}In reactions is discussed. In this method the contaminant ^{114m}In is not fed during decay of nuclei belonging to A=114 isobaric chain. Starting from the ^{115}Sn target it is possible to produce ^{114}In in reactions of the type (^{1}H, 2pxn), (^{1}H, α) etc. Fortunately, these reactions have low cross sections, not exceeding a few Mb in the maxima of their excitation functions. The excitation functions of reactions leading to ^{111}In mentioned above were calculated in the proton energy range 6-100 MeV using to Overlaid Alice code. These calculations indicate that ^{111}In can be produced with highest cross sections by irradiation of enriched ^{112}Sn target with protons of energy lower than 40 MeV. For the ^{114,115,116,117}Sn targets production of ^{111}In requires beside enriched targets also higher proton energies (E_{1H} > 100 MeV). In order to validate the calculations measurements using 40 and 100 MeV protons would be highly desired, although the calculated cross sections seem to be exact enough, to provide information on contamination by different radioisotopes produced during bombardment by protons. (author). 6 refs, 6 figs, 5 tabs.

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Refer also to citation(s) 16204

16251 (ETDE-DE–72) **Investigations of the inflammability of solutions using the oxygen index process.** Rietz, G.; Schremmer, U.; Wolf, K. Technische Univ. Magdeburg (Germany). Wissenschaftsbereich Sicherheitstechnik. 1993. 21p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 13RG9015. Order Number DE95769291. Source: OSTI; NTIS (US Sales Only).

The investigation was carried out on behalf of the Federal Minister for Research and Technology; it was to find out whether the oxygen index is a satisfactory method of assessing the potential hazard of inflammability of solutions consisting of burnable liquids and water. It was found that, given appropriate experimental conditions, the relative inflammability of such solutions can be determined from the oxygen index. The dependence of the oxygen index on the concentration yields a curve with a potential rise in the range of concentrations that is of interest. With an oxygen index limiting value of 0.30 for the distinction between inflammable and self-extinguishing substances one obtains specific limiting concentrations of inflammability for solutions. Nine liquids were investigated that can be mixed with water. The results are compatible with the results of vat inflammation experiments. (orig.)

16252 (LUTMDN-TMVK–3169) **Doppler Global Velocimetry.** Johansson, Bengt. Lund Univ. (Sweden). Dept. of Heat and Power Engineering. Feb 1995. 63p. Order Number DE95766675. Source: OSTI; NTIS.

A new Doppler based technique, Doppler Global Velocimetry (DGV), has been tested. DGV has been applied to a rotating wheel. This has served as a calibration tool to evaluate the linearity and noise level of DGV. The results show that DGV can give accurate velocity measurements under certain specific circumstances. A precision better than 1 m/s has been reached. More work is however needed to make the two used images overlap accurately. A precise overlap is crucial for good system operation. 32 refs, 22 figs

16253 (NEI-SE–196) **Dynamic single particle char combustion and its influence on the fate of fuel bound nitrogen. Numerical modelling and experiments.** Broden, H. Chalmers Univ. of Technology, Goeteborg (Sweden). Dept. of Energy Conversion. Sep 1994. 57p. Order Number DE95766676. Source: OSTI; NTIS.

A numerical char combustion model has been developed and an experimental investigation of the dynamic single char particle combustion process has been made. The numerical model calculates the temperature and gas concentration profiles of O2, CO, CO2, N2, H2O, NO, and N2O in the particle interior and its boundary layer throughout the dynamic carbon conversion process. The experimental investigation includes on-line measurements of O2, CO, CO2, NO and particle temperature. The particle temperature was measured by using a two color pyrometer. Complete temperature histories were measured. The measurements show, and the calculations confirm, that considerable amounts of CO2 are formed heterogeneously. The fuel nitrogen conversions to NO and N2O are primarily determined by the combustion regime. The yields of NO and N2O are higher during kinetically controlled combustion than during diffusionally controlled combustion. Calculations show that the fuel nitrogen conversions to NO and N2O are decreased by an increase in total pressure. Experimentally achieved fuel nitrogen to NO conversions, 35-37% at 5.0 bar and 56-63% at 1.0 bar, and comparisons to calculations indicate that only a minor fraction of fuel nitrogen is converted to N2O. 77 refs, 35 figs, 12 tabs

16254 (SAND–95-8456C) **Effects of gas-phase thermal expansion on the stability of deflagration through a porous energetic material.** Margolis, S.B. (Sandia National Labs., Livermore, CA (United States)); Williams, F.A. Sandia National Labs., Livermore, CA (United States). [1995]. 42p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950720–1: 30. AIAA/SAE/ASME joint propulsion conference and exhibit, San Diego, CA (United States), 10-12 Jul 1995). Order Number DE95004382. Source: OSTI; NTIS; GPO Dep.

The propagation of a deflagration wave through porous energetic materials, as in the case of strictly condensed-phase combustion, is subject to intrinsic diffusional/thermal instabilities that can lead to various oscillatory modes of burning. Under the assumption that the gas phase may be regarded as ideal but quasi-steady, asymptotic analyses are developed for the nonsteady, nonplanar deflagration of porous energetic solids, such as degraded nitramine propellants, that experience significant gas flow in the solid preheat region and are characterized by the presence of exothermic reactions in a bubbling melt layer at their surfaces. Relative motion between the gas and condensed phases is taken into account in both regions, and the derived asymptotic model is analyzed to obtain an explicit solution for steady, planar deflagration and a dispersion relation describing its linear stability. The present analysis parallels a similar study by the authors that allowed for a fully nonsteady gas phase, but neglected the effects of gas-phase thermal expansion. Nonetheless, qualitatively similar results are obtained, predicting a pulsating neutral stability boundary in the nondimensional activation energy - disturbance wavenumber plane beyond which nonsteady, nonplanar solutions are anticipated. Focusing on the realistic limit of small ratios of gas-phase to condensed-phase density and thermal conductivity, it is demonstrated that the effect of a nonzero porosity a, of the unburned solid material is generally destabilizing. The effect of gas-phase thermal expansion is also shown to be destabilizing, further suggesting that degraded propellants, which exhibit greater porosity than the pristine material, may be especially prone to nonsteady deflagration.

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Refer also to citation(s) 17419

16255 (UCRL-JC–119485) **Particle filtration: A comparison between theory and experiment.** Quintard, M. (L.E.P.T.-ENSAM (UA CNRS), Talence (France)); Whitaker, S. California Univ., Davis, CA (United States). Dept. of Chemical Engineering and Materials Science. Dec 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410330–1: Encontro sobre escoamento em meios porosos, Floriaopolis (Brazil), 19-21 Oct 1994). Order Number DE95009442. Source: OSTI; NTIS; GPO Dep.

The process of filtration of non-charged, submicron particles represents an example of transport in homogeneous and heterogeneous porous media that can be analyzed using the method of volume averaging. In this article the authors develop the local volume averaged particle transport equation for a homogeneous filter and compare the results with experimental data. The particle continuity equation is represented in terms of the first correction to the Smoluchowski equation that takes into account particle inertia effects for small Stokes numbers. This leads to a cellular efficiency that contains a minimum in the efficiency as a function of the particle size, and this allows them to identify the most penetrating particle size. Comparison of the theory with experimental results indicates that the first correction to the Smoluchowski equation gives reasonable results for the most penetrating particle size and for smaller particles; however, results for larger particles clearly indicate the need to extend the Smoluchowski equation to include higher order corrections. The influence of local heterogeneities on the measured filter efficiency may account for some of the observed differences between theory and experiment.

4202 Facilities, Equipment, and Techniques

Refer also to citation(s) 14915, 14933, 14938, 14943, 14944, 14964, 15060, 15062, 15070, 15081, 15082, 15093, 15105, 15107, 15129, 15462, 15592, 15721, 15768, 15771, 15797, 15886, 16465, 16467, 16760, 17373, 17386

16256 (ANL/RA/CP–84371) **Criticality control during conditioning of spent nuclear fuel in the Fuel Cycle Facility.** Lell, R.M. (Argonne National Lab., IL (United States). Reactor Analysis Div.); Khalil, H.S. Argonne National Lab., IL (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–35: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95009898. Source: OSTI; NTIS; INIS; GPO Dep.

Spent nuclear fuel may be unacceptable for direct repository storage because of composition, enrichment, form, physical condition, or the presence of undesirable materials such as sodium. Fuel types which are not acceptable for direct storage must be processed or conditioned to produce physical forms which can safely be stored in a repository. One possible approach to conditioning is the pyroprocess implemented in the Fuel Cycle Facility (FCF) at Argonne National Laboratory-West. Conditioning of binary (U-Zr) and ternary (U-Pu-Zr) metallic fuels from the EBR-2 reactor is used to demonstrate the process. Criticality safety considerations limit batch sizes during the conditioning steps and provide one constraint on the final form of conditioned material. Criticality safety during conditioning is assured by the integration of criticality safety analysis, equipment design, process development, a measurement program, accountability procedures, and a computerized Mass Tracking System. Criticality issues related to storage and shipment of conditioned material have been examined.

16257 (BNL–61540) **Cylindrical shell buckling through strain hardening.** Bandyopadhyay, K. (Brookhaven National Lab., Upton, NY (United States)); Xu, J.; Shteyngart, S.; Gupta, D. Brookhaven National Lab., Upton, NY (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–25: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95009545. Source: OSTI; NTIS; GPO Dep.

Recently, the authors published results of plastic buckling analysis of cylindrical shells. Ideal elastic-plastic material behavior was used for the analysis. Subsequently, the buckling analysis program was continued with the realistic stress-strain relationship of a stainless steel alloy which does not exhibit a clear yield point. The plastic buckling analysis was carried out through the initial stages of strain hardening for various internal pressure values. The computer program BOSOR5 was used for this purpose. Results were compared with those obtained from the idealized elastic-plastic relationship using the offset stress level at 0.2% strain as the yield stress. For moderate hoop stress values, the realistic stress-grain

case shows a slight reduction of the buckling strength. But, a substantial gain in the buckling strength is observed as the hoop stress approaches the yield strength. Most importantly, the shell retains a residual strength to carry a small amount of axial compressive load even when the hoop stress has exceeded the offset yield strength.

16258 (CONF-950601–1) **Criticality safety aspects of K-25 Building uranium deposit removal.** Haire, M.J. (Oak Ridge National Lab., TN (United States)); Jordan, W.C.; Ingram, J.C. III; Stinnet, E.C. Jr. Oak Ridge K-25 Site, TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OT21400. From Annual meeting of the American Nuclear Society; Philadelphia, PA (United States); 25-29 Jun 1995. Order Number DE95003445. Source: OSTI; NTIS; INIS; GPO Dep.

The K-25 Building of the Oak Ridge Gaseous Diffusion Plant (now the K-25 Site) went into operation during World War II as the first large scale production plant to separate ^{235}U from uranium by the gaseous diffusion process. It operated successfully until 1964, when it was placed in a stand-by mode. The Department of Energy has initiated a decontamination and decommissioning program. The primary objective of the Deposit Removal (DR) Project is to improve the nuclear criticality safety of the K-25 Building by removing enriched uranium deposits from unfavorable-geometry process equipment to below minimum critical mass. The method utilized to accomplish this are detailed in this report.

16259 (CONF-950601–6) **Criticality safety considerations for low-level-waste facilities.** Hopper, C.M. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From Annual meeting of the American Nuclear Society; Philadelphia, PA (United States); 25-29 Jun 1995. Order Number DE95009072. Source: OSTI; NTIS; INIS; GPO Dep.

The nuclear criticality safety for handling and burial of certain special nuclear materials (SNM) at low-level-waste (LLW) facilities is licensed by the US Nuclear Regulatory Commission (NRC). Recently, Oak Ridge National Laboratory (ORNL) staff assisted the NRC Office of Nuclear Material Safety and Safeguards, Low-Level-Waste and Decommissioning Projects Branch, in developing technical specifications for the nuclear criticality safety of ^{235}U and ^{235}Pu in LLW facilities. This assistance resulted in a set of nuclear criticality safety criteria that can be uniformly applied to the review of LLW package burial facility license applications. These criteria were developed through the coupling of the historic surface-density criterion with current computational technique to establish safety criteria considering SNM material form and reflector influences. This paper presents a summary of the approach used to establish and to apply the criteria to the licensing review process.

16260 (CONF-950601–7) **Maintaining scale as a reliable computational system for criticality safety analysis.** Bowmann, S.M.; Parks, C.V.; Martin, S.K. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. From Annual meeting of the American Nuclear Society; Philadelphia, PA (United States); 25-29 Jun 1995. Order Number DE95009071. Source: OSTI; NTIS; INIS; GPO Dep.

Accurate and reliable computational methods are essential for nuclear criticality safety analyses. The SCALE (Standardized Computer Analyses for Licensing Evaluation) computer code system was originally developed at Oak Ridge National Laboratory (ORNL) to enable users to easily set up and perform criticality safety analyses, as well as shielding, depletion, and heat transfer analyses. Over the fifteen-year life of SCALE, the mainstay of the system has been the criticality safety analysis sequences that have featured the KENO-IV and KENO-V.A Monte Carlo codes and the XSDRNPM one-dimensional discrete-ordinates code. The criticality safety analysis sequences provide automated material and problem-dependent resonance processing for each criticality calculation. This report details configuration management which is essential because SCALE consists of more than 25 computer codes (referred to as modules) that share libraries of commonly used subroutines. Changes to a single subroutine in some cases affect almost every module in SCALE! Controlled access to program source and executables and accurate documentation of modifications are essential to maintaining SCALE as a reliable code system. The modules and subroutine libraries in SCALE are programmed by a staff of approximately ten Code Managers. The SCALE Software Coordinator maintains the SCALE system and is the only person who modifies the production source, executables, and data libraries. All modifications must be authorized by the SCALE Project Leader prior to implementation.

16261 (CONF-950740–3) **Buckling analysis of an underground storage tank on the Oak Ridge Reservation.** Rezvani, M.A.; Webb, D.S. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995. Order Number DE95005900. Source: OSTI; NTIS; INIS; GPO Dep.

Many tanks are stored underground on the Oak Ridge Reservation in the state of Tennessee. The construction of some of these tanks dates back to the 1940s. A major Department of Energy (DOE) initiative is to assess the integrity of these existing tanks. These tanks must be analyzed and evaluated to ensure the safety of workers, the public, and the environment. This paper presents the results of a buckling analysis for two horizontal tanks in an underground vault. The tanks are 3.7 m (12.0 ft) in diam, 18.7 m (61.4 ft) long, and supported on two saddles. The analysis addresses different loading scenarios to complement the safety evaluation of these tanks. The loading conditions consider empty and half-full tanks in the vault flooded with either waste material or flood water to different heights. The results indicate that the tank will neither yield nor buckle for flood water of 5.5 m (18.0 ft) above the tank top.

16262 (JINR-R–10-94-379) **Microcontroller Unit.** Tulaev, A.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 7p. (In Russian). Order Number DE95627029. Source: OSTI; NTIS (US Sales Only); INIS.

The general purpose micro controller unit based on 8-bit single-chip microcomputer of the MCS-51 family is described. The controller has the data and program memories, a serial interface and an external bus for functional I/O extensions. The controller consists of a microcomputer chip, up to 4 ROM-RAM chips and 10 SSI and MSI chips, and it measures 160x120 mm. Both hardware and software micro system debugging tools are described. (author). 8 refs., 1 fig., 1 tab.

16263 (LA-UR–95-47) **Bolt preload selection for pulsed-loaded vessel closures.** Duffey, T.A.; Lewis, B.B.; Bowers, S.M. Los Alamos National Lab., NM (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950740–9: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95006346. Source: OSTI; NTIS; GPO Dep.

Bounding, closed-form solutions are developed for selecting the bolt preload for a square, flat plate closure subjected to a pressure pulse load. The solutions consider the limiting case in which preload is primarily dependent on closure bending response as well as the limiting case in which preload depends on elastic bolt response. The selection of bolt preload is illustrated. Also presented in the paper is a detailed finite element analysis of dynamically loaded, bolted circular closure. The responses of the structure, closure, and bolts are included, and results are obtained for various preloads. The analysis illustrates a method of bolt preload modeling for use in general finite element computer programs.

16264 (LBL-PUB–754) **The art and science of magnet design: A Festschrift in honor of Klaus Halbach. Volume 1.** Cross, J. (ed.). Lawrence Berkeley Lab., CA (United States). Feb 1995. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95008449. Source: OSTI; NTIS; INIS; GPO Dep.

This is a collection of technical papers and personal remembrances written expressly for the Halbach Symposium and dedicated to Klaus Halbach. The topics presented offer a hint of

the diversity of Klaus's scientific career. Most of the papers deal with magnets for accelerators and accelerator facilities. Other topics covered are free electron lasers, Halbach array motor/generators, radiation and gas conduction heat transport across a dewar multilayer insulation system, and surface structural determination from Fourier transforms of angle-resolved photoemission extended fine structure. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

16265 (LBL-PUB–755) **The art and science of magnet design: Selected notes of Klaus Halbach. Volume 2.** Lawrence Berkeley Lab., CA (United States). Feb 1995. 262p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95008450. Source: OSTI; NTIS; INIS; GPO Dep.

This volume contains a compilation of 57 notes written by Dr. Klaus Halbach selected from his collection of over 1650 such documents. It provides an historic snapshot of the evolution of magnet technology and related fields as the notes range from as early as 1965 to the present, and is intended to show the breadth of Dr. Halbach's interest and ability that have long been an inspiration to his many friends and colleagues. As Halbach is an experimental physicist whose scientific interests span many areas, and who does his most innovative work with pencil and paper rather than at the workbench or with a computer, the vast majority of the notes in this volume were handwritten and their content varies greatly–some reflect original work or work for a specific project, while others are mere clarifications of mathematical calculations or design specifications. As the authors converted the notes to electronic form, some were superficially edited and corrected, while others were extensively re-written to reflect current knowledge and notation. The notes are organized under five categories which reflect their primary content: Beam Position Monitors, (bpm), Current Sheet Electron Magnets (csem), Magnet Theory, (thry), Undulators and Wigglers (u-w), and Miscellaneous (misc). Within the category, they are presented chronologically starting from the most recent note and working backwards in time.

16266 (NEI-NO–547) **Major aspects of cost effective satellite field developments.** Lindland, H.J. (Statoil (Norway)); Klemp, S. Norsk Petroleumsforening, Oslo (Norway). 1994. 18p. (CONF-9408229–54: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766623. Source: OSTI; NTIS.

The role of the paper is to provide a background and overview of todays state-of-the-art within the multiphase technology (MP). The emphasis is on the North Sea relevant challenges, but with a close link to future deepwater developments. Economics is touched on throughout the paper, with emphasis on major cost saving elements involved with the use of MP technology for satellite developments. 21 refs.

16267 (NEI-NO–550) **Chemical inhibition of carbon steel lines.** Stevens, C. (Exxon Chemical Norden (Norway)); Hedges, W.M.; Haslegrave, J.A. Norsk Petroleumsforening, Oslo (Norway). 1994. 11p. (CONF-9408229–57: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766626. Source: OSTI; NTIS.

In recent years the offshore oil industry has seen a move towards either unmanned platforms or subsea completions. The primary reasons for this are cost and safety. One of the consequences of this is that there is little or no processing of the produced fluids close to the wellhead. Thus an increasing number of pipelines have to carry multiphase fluids. Many of these fluids are from marginal fields and can contain high levels of carbon dioxide or hydrogen sulphide at elevated temperatures. This makes the fluids highly corrosive. Under such conditions there is a need for corrosion control. An early decision that the operator must make is whether to fabricate the pipelines from corrosion resistant alloy or use carbon steel with a corrosion inhibitor treatment. The present paper discusses some of the issues which contribute to the decision making process. 4 refs., 3 tabs.

16268 (NEI-NO–551) **Internal corrosion management and material selection in multiphase transport lines.** Lunde, L. (Institutt for Energiteknikk, Kjeller (Norway)); Dugstad, A. Norsk Petroleumsforening, Oslo (Norway). 1994. 21p. (CONF-9408229–58: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766627. Source: OSTI; NTIS.

External corrosion control of the pipeline seawater side is well understood and is easily managed by proper surface protection and anode design. The material loss on the inside due to CO_2-corrosion may, however, be a limiting factor for the use of carbon steels in pipelines for unprocessed or partly processed hydrocarbons. The phenomena associated with material loss in a multiphase pipeline is very complex, involving the chemistry of the pipeline fluids, the metallurgy of the pipeline material and the pipeline hydraulics, which all interact in a complex way. Inhibition of corrosion and inhibitor distribution along the pipeline are also fields of special concern. The present paper gives a brief description of some of the fields which are developed or being considered for transport of unprocessed hydrocarbons in the Norwegian sector of the North Sea, and new aspects of internal corrosion management of flow or pipelines for specific fields are being discussed. 18 refs., 6 figs., 2 tabs.

16269 **Lead-free glovebox glove.** Villarreal, R.; Phillips, J.R.; Olivas, J.D.; Stalnaker, N.D. To Dept. of Energy. 1993. Filed date 17 Mar 1993. U.S. Patent Application 8-032,936. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009980. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a lead-free glovebox glove. For certain applications, currently used glovebox gloves that contain lead, which is a RCRA-identified toxic metal, as an attenuation medium can be replaced by gloves containing a blend of bismuth and rare-earth oxides which are not RCRA-hazardous metals. The present invention includes the use of these oxides embedded in soft plastic as internal layers of glovebox gloves for the absorption and attenuation of α-particles, β-particles, characteristic x-rays, and 60 and 100 keV γ-rays arising from the use of enriched Pu and Pu containing ^{241}Am.

16270 **Fabric panel clean change-out frame.** Brown, R.M. To Dept. of Energy. 1993. Filed date 18 Mar 1993. U.S. Patent Application 8-033,473. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-89PN38014. Order Number DE95009981. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a fabric panel clean change-out frame, for use on a containment structure having rigid walls, is formed of a compression frame and a closure panel. The frame is formed of elongated spacers, each carrying a plurality of closely spaced flat springs, and each having a hooked lip extending on the side of the spring facing the spacer. The closure panel is includes a perimeter frame formed of flexible, wedge-shaped frame members that are receivable under the springs to deflect the hooked lips. A groove on the flexible frame members engages the hooked lips and locks the frame members in place under the springs. A flexible fabric panel is connected to the flexible frame members and closes its center.

16271 (SAND–94-2270C) **Microfabricated actuators and their application to optics.** Sniegowski, J.J.; Garcia, E.J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–21: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95008156. Source: OSTI; NTIS; GPO Dep.

Several authors have given overviews of microelectromechanical systems, including microactuators. In our presentation we will review some of these results, and provide a brief description of the basic principles of operation, fabrication, and application, of a few selected microactuators (electrostatic and surface tension driven). We present a description of a three-level mechanical polysilicon surface-micromachining technology with a discussion of the advantages of this level of process complexity. This technology, is

capable of forming complex, batch-fabricated, interconnected, and interactive, microactuated micromechanisms which include optical elements. The inclusion of a third deposited layer of mechanical polysilicon greatly extends the degree of complexity available for micromechanism design. Two examples of microactuators fabricated using this process are provided to illustrate the capabilities and usefulness of the technology. The first actuator is an example of a novel actuation mechanism based on the effect of surface tension at these micro-scale dimensions and of a microstructure within a microstructure. The second is a comb-drive-based microengine which has direct application as a drive and power source for micro optical elements, specifically, micro mirrors and micro shutters. This design converts linear oscillatory motion from electrostatic comb drive actuators into rotational motion via a direct linkage connection. The microengine provides output in the form of a continuously rotating output gear that is capable of delivering drive torque to a micromechanism.

16272 (SAND–94-2409C) **Effects of mixed waste simulants on transportation packaging plastic components.** Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950646–3: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95006305. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of hazardous and radioactive materials packaging is to, enable these materials to be transported without posing a threat to the health or property of the general public. To achieve this aim, regulations have been written establishing general design requirements for such packagings. While no regulations have been written specifically for mixed waste packaging, regulations for the constituents of mixed wastes, i.e., hazardous and radioactive substances, have been codified. The design requirements for both hazardous and radioactive materials packaging specify packaging compatibility, i.e., that the materials of the packaging and any contents be chemically compatible with each other. Furthermore, Type A and Type B packaging design requirements stipulate that there be no significant chemical, galvanic, or other reaction between the materials and contents of the package. Based on these requirements, a Chemical Compatibility Testing Program was developed in the Transportation Systems Department at Sandia National Laboratories (SNL). The program, supported by the US Department of Energy's (DOE) Transportation Management Division, EM-261 provides the means to assure any regulatory body that the issue of packaging material compatibility towards hazardous and radioactive materials has been addressed. In this paper, we describe the general elements of the testing program and the experimental results of the screening tests. The implications of the results of this testing are discussed in the general context of packaging development. Additionally, we present the results of the first phase of this experimental program. This phase involved the screening of five candidate liner and six seal materials against four simulant mixed wastes.

16273 (SAND–94-2485C) **Thermal testing of packages for transport of radioactive wastes.** Koski, J.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950646–10: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95008435. Source: OSTI; NTIS; INIS; GPO Dep.

Shipping containers for radioactive materials must be shown capable of surviving tests specified by regulations such as Title 10, Code of Federal Regulations, Part 71 (called 10CFR71 in this paper) within the United States. Equivalent regulations hold for other countries such as Safety Series 6 issued by the International Atomic Energy Agency. The containers must be shown to be capable of surviving, in order, drop tests, puncture tests, and thermal tests. Immersion testing in water is also required, but must be demonstrated for undamaged packages. The thermal test is intended to simulate a 30 minute exposure to a fully engulfing pool fire that could occur if a transport accident involved the spill of large quantities of hydrocarbon fuels. Various qualification methods ranging from pure analysis to actual pool fire tests have been used to prove regulatory compliance. The purpose of this paper is to consider the alternatives for thermal testing, point out the strengths and weaknesses of each approach, and to provide the designer with the information necessary to make informed decisions on the proper test program for the particular shipping container under consideration. While thermal analysis is an alternative to physical testing, actual testing is often emphasized by regulators, and this report concentrates on these testing alternatives.

16274 (SAND–94-2637C) **Simulation of hypervelocity impact on massively parallel supercomputer.** Fang, H.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950788–7: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95007735. Source: OSTI; NTIS; GPO Dep.

Hypervelocity impact studies are important for debris shield and armor/anti-armor research and development. Numerical simulations are frequently performed to complement experimental studies, and to evaluate code accuracy. Parametric computational studies involving material properties, geometry and impact velocity can be used to understand hypervelocity impact processes. These impact simulations normally need to address shock wave physics phenomena, material deformation and failure, and motion of debris particles. Detailed, three-dimensional calculations of such events have large memory and processing time requirements. At Sandia National Laboratories, many impact problems of interest require tens of millions of computational cells. Furthermore, even the inadequately resolved problems often require tens or hundred of Cray CPU hours to complete. Recent numerical studies done by Grady and Kipp at Sandia using the Eulerian shock wave physics code CTH demonstrated very good agreement with many features of a copper sphere-on-steel plate oblique impact experiment, fully utilizing the compute power and memory of Sandia's Cray supercomputer. To satisfy requirements for more finely resolved simulations in order to obtain a better understanding of the crater formation process and impact ejecta motion, the numerical work has been moved from the shared-memory Cray to a large, distributed-memory, massively parallel supercomputing system using PCTH, a parallel version of CTH. The current work is a continuation of the studies, but done on Sandia's Intel 1840-processor Paragon X/PS parallel computer. With the great compute power and large memory provided by the Paragon, a highly detailed PCTH calculation has been completed for the copper sphere impacting steel plate experiment. Although the PCTH calculation used a mesh which is 4.5 times bigger than the original Cray setup, it finished in much less CPU time.

16275 (SAND–95-0582C) **Dynamic pulse buckling of cylindrical shells under axial impact: A benchmark study of 2D and 3D finite element calculations.** Hoffman, E.L.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740–26: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95009858. Source: OSTI; NTIS; INIS; GPO Dep.

A series of tests investigating dynamic pulse buckling of a cylindrical shell under axial impact is compared to several 2D and 3D finite element simulations of the event. The purpose of the work is to investigate the performance of various analysis codes and element types on a problem which is applicable to radioactive material transport packages, and ultimately to develop a benchmark problem to qualify finite element analysis codes for the transport package design industry. During the pulse buckling tests, a buckle formed at each end of the cylinder, and one of the two buckles became unstable and collapsed. Numerical simulations of the test were performed using PRONTO, a Sandia developed transient dynamics analysis code, and ABAQUS/Explicit with both shell and continuum elements. The calculations are compared to the tests with respect to deformed shape and impact load history.

16276 (SAND–95-0610C) **A collision avoidance system for workpiece protection.** Schmitt, D.J. (Sandia National Labs., Albuquerque, NM (United States)); Weber, T.M.; Novak, J.L.;

Maslakowski, J.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505169–2: International robots and vision automation show and conference, Detroit, MI (United States), 8-11 May 1995). Order Number DE95009842. Source: OSTI; NTIS; GPO Dep.

This paper describes an application of Sandia's non-contact capacitive sensing technology for collision avoidance during the manufacturing of rocket engine thrust chambers. The collision avoidance system consists of an octagon shaped collar with a capacitive proximity sensor mounted on each face. The sensors produced electric fields which extend several inches from the face of the collar and detect potential collisions between the robot and the workpiece. A signal conditioning system processes the sensor output and provides varying voltage signals to the robot controller for stopping the robot.

16277 (SAND–95-0662C) **Thermal measurements to characterize large fires.** Gritzo, L.A. (Sandia National Labs., Albuquerque, NM (United States)); Gill, W.; Keltner, N. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505201–1: 41. international instrumentation symposium, Denver, CO (United States), 7-11 May 1995). Order Number DE95009860. Source: OSTI; NTIS; GPO Dep.

Full-scale fire characterization tests are becoming less frequent due to cost restrictions and environmental concerns. This trend, combined with significant advances in fire field modeling, has resulted in an increased effort to perform well-designed experiments which support the development and validation of numerical tools. In pursuit of improved fire characterization, large-fire measurement techniques in large-scale (D > 2m) fires are reviewed in this work. Primary attention is focused on the measurement of temperature and heat flux. Additional measurements of quantities such as soot volume fraction, soot emission temperature, and gas species are also addressed. Issues relating to the use of existing techniques, and methods for improving and interpreting the results from existing measurement techniques are presented. Alternate techniques for fire characterization and needs for development of advanced measurement technology are also briefly discussed.

16278 (SAND–95-8214) **4,4′-Methylene Dianiline (MDA) and thermal abuse of Rigid Polyurethane Foam.** Lari, P. Sandia National Labs., Livermore, CA (United States). Mar 1995. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010342. Source: OSTI; NTIS; GPO Dep.

Rigid Polyurethane Foam is used for weapon support in conjunction with the H1501A Transportation Accident Resistant Container (TARC). The foam is flame resistant, however like all organic materials, it will burn with enough heat and oxygen. Normally the foam will not melt, but will form a char and is nonhazardous. There are instances when the combination of heat and oxygen will cause the foam to decompose resulting in 4,4′-Methylene Dianiline (MDA) a Liver toxin and suspect carcinogen. MDA contamination occurred during robustness tests DROP-20/BURN-20. This report chronicles the events causing the contamination and method used for disposal.

16279 (UCRL-ID–119071) **Radar imagery from the 1994 Loch Linnhe trials.** Lehman, S.K. (Lawrence Livermore National Lab., CA (United States)); Mullenhoff, C.J.; Jones, H.; Berry, G.; Newman, M.J.; Lamont-Smith, T.; Hirst, P.; Ward, K. Lawrence Livermore National Lab., CA (United States). 26 Oct 1994. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010662. Source: OSTI; NTIS; GPO Dep.

The 1994 Loch Linnhe radar ocean imaging trials were held from September 4 through September 17. Two ships were used: the R.V. Colonel Templer, and the RMAS Collie. Thorn EMI, Inc., fielded a dual band, dual polarization radar on a hillside overlooking the loch. We present here the imagery for all but one of the ship runs.

16280 (UCRL-JC–115893) **Preliminary field evaluation of high efficiency steel filters.** Bergman, W. (Lawrence Livermore National Lab., CA (United States)); Larsen, G.; Lopez, R.; Wilson, K.; Simon, K.; Frye, L. Lawrence Livermore National Lab., CA (United States). Nov 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940738–11: 23. DOE/NRC nuclear air cleaning and treatment conference, Buffalo, NY (United States), 25-28 Jul 1994). Order Number DE95009465. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have conducted an evaluation of two high efficiency steel filters in the exhaust of an uranium oxide grit blaster at the Y-12 Plant in Oak Ridge Tennessee. The filters were installed in a specially designed filter housing with a reverse air-pulse cleaning system for automatically cleaning the filters in-place. Previous tests conducted on the same filters and housing at LLNL under controlled conditions using Arizona road dust showed good cleanability with reverse air pulses. Two high efficiency steel filters, containing 64 pleated cartridge elements housed in the standard 2′ x 2′ x l′ HEPA frame, were evaluated in the filter test housing using a 1,000 cfm slip stream containing a high concentration of depleted uranium oxide dust. One filter had the pleated cartridges manufactured to the authors specifications by the Pall Corporation and the other by Memtec Corporation. Test results showed both filters had a rapid increase in pressure drop with time, and reverse air pulses could not decrease the pressure drop. The authors suspected moisture accumulation in the filters was the problem since there were heavy rains during the evaluations, and the pressure drop of the Memtec filter decreased dramatically after passing clean, dry air through the filter and after the filter sat idle for one week. Subsequent laboratory tests on a single filter cartridge confirmed that water accumulation in the filter was responsible for the increase in filter pressure drop and the inability to lower the pressure drop by reverse air pulses. No effort was made to identify the source of the water accumulation and correct the problem because the available funds were exhausted.

16281 (UCRL-JC–118797-Rev.1) **A probabilistic risk assessment of the LLNL Plutonium Facility's evaluation basis fire operational accident. Revision 1.** Brumburgh, G.P. Lawrence Livermore National Lab., CA (United States). 27 Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950740–1-Rev.1: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95009529. Source: OSTI; NTIS; INIS; GPO Dep.

The Lawrence Livermore National Laboratory (LLNL) Plutonium Facility conducts numerous programmatic activities involving plutonium to include device fabrication, development of improved and/or unique fabrication techniques, metallurgy research, and laser isotope separation. A Safety Analysis Report (SAR) for the building 332 Plutonium Facility was completed in July 1994 to address operational safety and acceptable risk to employees, the public, government property, and the environmental. This paper outlines the PRA analysis of the Evaluation Basis Fire (EBF) operational accident. The EBF postulates the worst-case programmatic impact event for the Plutonium Facility.

16282 (WHC-SA–2804) **Performance testing of a system for remote ultrasonic examination of the Hanford double-shell waste storage tanks.** Pfluger, D.C. (Westinghouse Hanford Co., Richland, WA (United States)); Somers, T.; Berger, A.D. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216–112: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95008030. Source: OSTI; NTIS; INIS; GPO Dep.

A mobile robotic inspection system is being developed for remote ultrasonic examination of the double wall waste storage tanks at Hanford. Performance testing of the system includes demonstrating robot mobility within the tank annulus, evaluating the accuracy of the vision based navigation process, and verifying ultrasonic and video system performance. This paper briefly describes the system and presents a summary of the plan for performance testing of the ultrasonic testing system. Performance test results will be presented at the conference.

16283 (WHC-SD-SQA-CSA–20390-Rev.1) **CSER 90-006, addendum 1: Criticality safety control for source term reduction**

project in the scrubber glovebox of Building 232-Z. Revision 1. Hess, A.L. Westinghouse Hanford Co., Richland, WA (United States). 10 Mar 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95009149. Source: OSTI; NTIS; INIS; GPO Dep.

This Criticality Safety Evaluation Report addendum extends the coverage of the original CSER (90-006) about dismantling the ductwork in 232-Z to include cleanout of the Scrubber Glovebox, with an estimated residual Pu holdup of less than 200 grams. For conservatism and containment considerations, the provisions about waste packaging and water exclusion from the original work are retained, even though it is not credible for the Scrubber Pu content to be made critical with water added (NDA gives about 1/3 a minimum critical mass).

16284 (WHC-SD-TP-OMM–002) **Operating and maintenance instructions for the Hedgehog sample package (A DOT 7A Type A Package).** Edwards, W.S. Westinghouse Hanford Co., Richland, WA (United States). 7 Apr 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010191. Source: OSTI; NTIS; INIS; GPO Dep.

The Operating and Maintenance Instructions for the HEDGEHOG Sample Package describe the sequence of operations required to use this package as a US Department of Transportation (DOT) Requirements Specification 7A, Type A package for radioactive materials (RAM). This instruction includes air shipment in accordance with the International Air Transport Association (IATA) Dangerous Goods Regulations, as well as the DOT. This package can be used to ship up to one liter of radioactive liquid without shielding and up to 250 ml of radioactive liquid that requires shielding.

16285 (WHC-SD-W059-FHA–001) **Preliminary Fire Hazards Analysis for W-059, B Plant canyon ventilation upgrade.** Condron, J.D.; Roege, P.E. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010577. Source: OSTI; NTIS; INIS; GPO Dep.

This Preliminary Fire Hazards Analysis determines the fire hazards associated with the W-059, B Plant canyon ventilation upgrade project.

16286 (WSRC-MS–94-0544) **Exposure rate response analysis of criticailty accident dectector at Savannah River Site.** Zino, J.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950601–2: Annual meeting of the American Nuclear Society, Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95004801. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis investigated the exposure response behavior of gamma-ray ionization chambers used in the criticality accident systems at the Savannah River Site (SRS). The project consisted of performing exposure response measurements with a calibrated ^{137}Cs source for benchmarking of the MCNP Monte Carlo code. MCNP was then used to extrapolate the ion chamber's response to gamma-rays with energies outside the current domain of measured data for criticality fission sources.

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Refer also to citation(s) 16301, 17344

16287 (ANL–95/6) **First assessment of computations of turbulent bubbly flow and particulate flow with the COMMIX-M program.** Bottoni, M. (Argonne National Lab., IL (United States). Energy Technology Div.); Chang, F.C.; Ding, J. Argonne National Lab., IL (United States). May 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009035. Source: OSTI; NTIS; GPO Dep.

The COMMIX-M computer code, which describes steady-state and transient single- and multicomponent flows in engineering systems, has been implemented to simulate suspension flows in laminar regimes and turbulent and bubbly particulate flows. This report presents a synopsis of the present code's capabilities, with particular emphasis on the recent development of turbulence models, and explains in detail the modifications necessary to simulate particulate flows and bubbly flows. First results of computations of turbulent bubbly and particulate flows are then given and compared with results of computations reported in the literature and with preliminary experimental results obtained at the Kernforschungszentrum Karlsruhe (Germany).

16288 (DOE/ER/13034–2) **General particle transport equation. Final report.** Lafi, A.Y.; Reyes, J.N. Jr. Oregon State Univ., Corvallis, OR (United States). Dept. of Nuclear Engineering. Dec 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER13034. (OSU-NE–9409). Order Number DE95009679. Source: OSTI; NTIS; INIS; GPO Dep.

The general objectives of this research are as follows: (1) To develop fundamental models for fluid particle coalescence and breakage rates for incorporation into statistically based (Population Balance Approach or Monte Carlo Approach) two-phase thermal hydraulics codes. (2) To develop fundamental models for flow structure transitions based on stability theory and fluid particle interaction rates. This report details the derivation of the mass, momentum and energy conservation equations for a distribution of spherical, chemically non-reacting fluid particles of variable size and velocity. To study the effects of fluid particle interactions on interfacial transfer and flow structure requires detailed particulate flow conservation equations. The equations are derived using a particle continuity equation analogous to Boltzmann's transport equation. When coupled with the appropriate closure equations, the conservation equations can be used to model nonequilibrium, two-phase, dispersed, fluid flow behavior. Unlike the Eulerian volume and time averaged conservation equations, the statistically averaged conservation equations contain additional terms that take into account the change due to fluid particle interfacial acceleration and fluid particle dynamics. Two types of particle dynamics are considered; coalescence and breakage. Therefore, the rate of change due to particle dynamics will consider the gain and loss involved in these processes and implement phenomenological models for fluid particle breakage and coalescence.

16289 (DTU-ISVA-PR–75) **Progress report no. 75.** Danmarks Tekniske Univ., Lyngby (Denmark). Inst. for Stroemningsmekanik og Vandbygning. 1994. 82p. Order Number DE95766444. Source: OSTI; NTIS.

The progress report no. 75 of the Danish Institute of Hydrodynamics and Hydraulic Engineering consists of 5 contributions dealing with turbulence modelling over 2-dimensional bed forms, in a Borda outlet and in semi-3d flow, velocity profiles in spilling breakers etc. (EG)

16290 (ETDE-DE–87) **A parametric study of film condensation of pure gases and mixtures with non-condensable gas in a shock tube.** Max-Planck-Institut fuer Stroemungsforschung. Bericht, v. 24/1994. Teske, T. Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany). Dec 1994. 219p. (In German). Order Number DE95769847. Source: OSTI; NTIS (US Sales Only).

Experiments on film condensation of pure gases and mixtures with nitrogen in a shock tube are presented. Gases under investigation are methanol, ethanol, n-heptane and mixtures of ethanol and nitrogen. The time dependent thickness of condensing liquid layers has been measured on the end and side walls of the driven section by means of an interferometric method. For the first time the growth on a non-transparent end wall made of steel has been observed. Growth rates obtained using a quartz respectively a steel substrate demonstrate the strong dependence on the thermal conductivity of the wall. Measurement series having a common initial state for fixed phase change number and different fraction of non-condensable gas and vice versa exhibit the nearly independent influence of both parameters. The quantitative effect of the fraction of non-condensable gas has been studied down to partial pressure ratios of 400:1. The growth rate is influenced strongly by the fraction of non-condensable gas. Simple formulas, describing the dependence on phase change number and amount of non-condensable gas are given for growth rates at the end wall as well as at the side wall behind the incoming shock. (orig.)

16291 (JAERI-Conf–94-006) **Abstracts of the Mini-Symposium on Stability and Bifurcation in Fluid Motions September 9-10, 1994, Tokai, Japan.** Fujimura, Kaoru (ed.)

(Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Jan 1995. 50p. Order Number DE95767955. Source: OSTI; NTIS; INIS.

This is the abstracts of the Mini-Symposium on Stability and Bifurcation in Fluid Motions held on September 9-10, 1994 at the Tokai Establishment of JAERI and the Tokai Kaikan. Sixteen talks were given on various important subjects related with stability and bifurcation phenomena in fluids. All of them are theoretical and numerical analyses involving linear stability analysis, weakly nonlinear analysis, bifurcation analysis, and direct computation of nonlinearly equilibrium solutions. (author).

16292 (SAND–94-1735C) **Velocity boundary conditions for vorticity formulations of the incompressible Navier-Stokes equations.** Kempka, S.N. (Sandia National Labs., Albuquerque, NM (United States)); Strickland, J.H.; Glass, M.W.; Peery, J.S.; Ingber, M.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950283–1: Application of vortex methods to engineering problems forum, Albuquerque, NM (United States), 22-24 Feb 1995). Order Number DE95008715. Source: OSTI; NTIS; GPO Dep.

Velocity boundary conditions for the vorticity form of the incompressible, viscous fluid momentum equations are presented. Vorticity is created on boundaries to simultaneously satisfy the tangential and normal components of the velocity boundary condition. The newly created vorticity is specified by a kinematical formulation which is a generalization of Helmholtz decomposition of a vector field. Related forms of the decomposition were developed by Bykhovskiy and Smirnov in 1983, and Wu and Thompson in 1973. Though it has not been generally recognized as such, these formulations resolve the over-specification issues associated with determining a velocity field from velocity boundary conditions and a vorticity field. The generalized decomposition has not been widely used, however, apparently due to a general lack of a useful physical interpretation. An analysis is presented which shows that the generalized decomposition has a relatively simple physical interpretation which facilitates its numerical implementation. The implementation of the generalized decomposition for the normal and tangential velocity boundary conditions is discussed in detail. As an example of the use of this boundary condition, the flow in a lid-driven cavity is simulated. The solution technique is based on a Lagrangian transport algorithm in the hydrocode ALEGRE. ALEGRE's Lagrangian transport algorithm has been modified to solve the vorticity transport equation, thus providing a new, accurate method to simulate incompressible flows. This numerical implementation and the new boundary condition formulation allow vorticity-based formulations to be used in a wider range of engineering problems.

16293 (SAND–95-0278C) **Viscous diffusion of vorticity in unsteady wall layers using the diffusion velocity concept.** Strickland, J.H.; Kempka, S.N.; Wolfe, W.P. Sandia National Labs., Albuquerque, NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950283–2: Application of vortex methods to engineering problems forum, Albuquerque, NM (United States), 22-24 Feb 1995). Order Number DE95008537. Source: OSTI; NTIS; GPO Dep.

The primary purpose of this paper is to provide a careful evaluation of the diffusion velocity concept with regard to its ability to predict the diffusion of vorticity near a moving wall. A computer code BDIF has been written which simulates the evolution of the vorticity field near a wall of infinite length which is moving in an arbitrary fashion. The simulations generated by this code are found to give excellent results when compared to several exact solutions. We also outline a two-dimensional unsteady viscous boundary layer model which utilizes the diffusion velocity concept and is compatible with vortex methods. A primary goal of this boundary layer model is to minimize the number of vortices generated on the surface at each time step while achieving good resolution of the vorticity field near the wall. Preliminary results have been obtained for simulating a simple two-dimensional laminar boundary layer.

16294 (UCRL-LR–114962) **Large-eddy simulation of turbulent flow using the finite element method.** McCallen, R.C. Lawrence Livermore National Lab., CA (United States). 15 Feb 1995. 346p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009464. Source: OSTI; NTIS; GPO Dep.

The equations of motion describing turbulent flows (in both the low and high Reynolds-number regimes) are well established. However, present day computers cannot meet the enormous computational requirement for numerically solving the governing equations for common engineering flows in the high Reynolds number turbulent regime. The characteristics that make turbulent, high Reynolds number flows difficult to simulate is the extreme range of time and space scales of motion. Most current engineering calculations are performed using semi-empirical equations, developed in terms of the flow mean (average) properties. These turbulence' models' (semi-empirical/analytical approximations) do not explicitly account for the eddy structures and thus, the temporal and spatial flow fluctuations are not resolved. In these averaging approaches, it is necessary to approximate all the turbulent structures using semi-empirical relations, and as a result, the turbulence models must be tailored for specific flow conditions and geometries with parameters obtained (usually) from physical experiments. The motivation for this research is the development of a finite element turbulence modeling approach which will ultimately be used to predict the wind flow around buildings. Accurate turbulence models of building flow are needed to predict the dispersion of airborne pollutants. The building flow turbulence models used today are not capable of predicting the three-dimensional separating and reattaching flows without the manipulation of many empirical parameters. These empirical parameters must be set by experimental data and they may vary unpredictably with building geometry, building orientation, and upstream flow conditions.

4205 Materials Testing

Refer also to citation(s) 15479, 15838, 15839, 15840, 15841, 15892, 16051, 16275, 16282

16295 (CONF-941144–106) **Cracking during nanoindentation and its use in the measurement of fracture toughness.** Harding, D.S. (Rice Univ., Houston, TX (United States). Dept. of Materials Science); Pharr, G.M.; Oliver, W.C. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States);Texas Advanced Research Program, TX (United States). DOE Contract AC05-84OR21400. Grant 003652-123. From 1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994. Order Number DE95008839. Source: OSTI; NTIS; GPO Dep.

Results of an investigation aimed at developing a technique by which the fracture toughness of a thin film or small volume can be determined in nanoindentation experiments are reported. The method is based on the radial cracking which occurs when brittle materials are deformed by a sharp indenter such as a Vickers or Berkovich diamond. In microindentation experiments, the lengths of radial cracks have been found to correlate reasonably well with fracture toughness, and a simple semi-empirical method has been developed to compute the toughness from the crack lengths. However, a problem is encountered in extending this method into the nanoindentation regime with the standard Berkovich indenter in that there are well defined loads, called cracking thresholds, below which indentation cracking does not occur in most brittle materials. We have recently found that the problems imposed by the cracking threshold can be largely overcome by using an indenter with the geometry of the corner of a cube. For the cube-corner indenter, cracking thresholds in most brittle materials are as small as 1 mN (~0.1 grams). In addition, the simple, well-developed relation between toughness and crack length used for the Vickers indenter in the microindentation regime can be used for the cube-corner indenter in the nanoindentation regime provided a different empirical constant is used.

16296 (PNL-SA–24388) **Hanford Permanent Isolation Barrier Program: Asphalt technology development.** Freeman, H.D.; Romine, R.A. Pacific Northwest Lab., Richland, WA (United

States). Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–21: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007816. Source: OSTI; NTIS; INIS; GPO Dep.

An important component of the Hanford Permanent Isolation Barrier is the use of a two-layer composite asphalt system, which provides backup water diversion capabilities if the primary capillary barrier fails to meet infiltration goals. Because of asphalt's potential to perform to specification over the 1000-year design life criterion, a composite asphalt barrier (HMAC/fluid-applied polymer-modified asphalt) is being considered as an alternative to the bentonite clay/high density poly(ethylene) barriers for the low-permeability component of the Hanford Permanent Isolation Barrier. The feasibility of using asphalt as a long-term barrier is currently being studied. Information that must be known is the ability of asphalt to retain desirable physical properties over a period of 1000 years. This paper presents the approach for performing accelerated aging tests and evaluating the performance of samples under accelerated conditions. The results of these tests will be compared with asphalt artifact analogs and the results of modeling the degradation of the selected asphalt composite to make life-cycle predictions.

16297 (UCRL-ID–119958) **Rationale and summary of methods for determining ultrasonic properties of materials at Lawrence Livermore National Laboratory.** Brown, A.E. Lawrence Livermore National Lab., CA (United States). 9 Feb 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009475. Source: OSTI; NTIS; GPO Dep.

This report is a summary of the methods used to determine ultrasonic velocities through the many materials tested at the Acoustic Properties of Materials Laboratory. Ultrasonic velocity techniques enable the determination of material properties, including elastic moduli, without harming the materials being tested, an advantage some over mechanical methods. Ultrasonic modulus determination has other advantages as well: (1) relative ease and low cost of material preparation; and (2) comparative analysis to physical testing as a function of material loading rate dependence. In addition, ultrasonic measurement provides clues to determine grain size and orientation, and provides a relative indication of material anisotropy with respect to the material geometry. The authors usually perform ultrasonic measurements on materials in ambient atmospheric conditions, and in a relatively free-free condition. However, the authors can perform them in other environments, as required. This paper describes some of the techniques used in this laboratory and shows how ultrasonic velocities are used to establish elastic constants. It also includes a sample test report for a homogeneous isotropic solid, along with a list of references.

16298 (UCRL-JC–118767) **Design considerations for NDE systems in a factory setting and the application to transmission manufacture at the Chrysler Transmission Plant in Kokomo, Indiana.** LaChapell, M. (Lawrence Livermore National Lab., CA (United States)); Perkins, D.E.; Schneberk, D.J.; Erb, S.H.; Nicholson, R.E. Lawrence Livermore National Lab., CA (United States). Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410331–1: ISATA international conference on new and alternative materials for the transportation industries, Aachen (Germany), 31 Oct - 4 nov 1994). Order Number DE95009568. Source: OSTI; NTIS; GPO Dep.

Chrysler Corp. and LLNL have entered into a collaboration to enhance the NDE technology at the Kokomo transmission plant. The project spans 3 years and a wide variety of different projects. Goals are making NDE automated, reliable, and capable of avoiding destructive testing. This requires NDE systems to be better utilized by quality teams on the shop floor and better connected for providing in one place a sufficient set of data for identifying problems in a manufacturing operation, and prescribing an adjustment. The approach is illustrated on two different processes, laser welding and pressure die casting; in each case data are combined from different NDE systems to enable a decision on an adjustment in process variables.

4210 Combustion Systems

Refer also to citation(s) 14759, 14776, 14777, 14778, 14779, 14780, 14781, 14782, 14783, 14784, 14785, 14786, 15373

16299 (DOE/METC/C–95/7176) **METC Combustion Research Facility.** Halow, J.S.; Maloney, D.J.; Richards, G.A. USDOE Morgantown Energy Technology Center, WV (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). (CONF-9411207–1: Advanced turbine systems annual program review, Arlington, VA (United States), 9-11 Nov 1994). Order Number DE95008774. Source: OSTI; NTIS; GPO Dep.

The objective of the Morgantown Energy Technology Center (METC) high pressure combustion facility is to provide a mid-scale facility for combustion and cleanup research to support DOE's advanced gas turbine, pressurized, fluidized-bed combustion, and hot gas cleanup programs. The facility is intended to fill a gap between lab scale facilities typical of universities and large scale combustion/turbine test facilities typical of turbine manufacturers. The facility is now available to industry and university partners through cooperative programs with METC. Currently two combustion rigs are operating and one additional project is under construction for the facility. Space is available in the test cells for at least one additional test rig. A pressurized pulsed combustor began operating in July of 1993. The combustor will carry out pulsed combustion of natural gas at pressures up to 10 atmospheres. A high pressure steady flow rig is currently completely fabricated. The objective of this rig is to test novel, steady-flow, pressurized combustors that produce very low NO_x and other emissions. An evaporation rig currently is in startup. This rig will test the concept of water injection in an externally fired cycle. The specific technical issue that the unit will address is evaporation rates of water droplets in high pressure flows.

16300 (DOE/METC/C–95/7179) **Combustion oscillation control by cyclic fuel injection.** Richards, G.A. (USDOE Morgantown Energy Technology Center, WV (United States)); Yip, M.J.; Robey, E.; Cowell, L.; Rawlins, D. USDOE Morgantown Energy Technology Center, WV (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). (CONF-950629–3: ASME international gas turbine and aeroengine congress and exposition: land, sea and air, Houston, TX (United States), 5-8 Jun 1995). Order Number DE95009548. Source: OSTI; NTIS; GPO Dep.

A number of recent articles have demonstrated the use of active control to mitigate the effects of combustion instability in afterburner and dump combustor applications. In these applications, cyclic injection of small quantities of control fuel has been proposed to counteract the periodic heat release that contributes to undesired pressure oscillations. This same technique may also be useful to mitigate oscillations in gas turbine combustors, especially in test rig combustors characterized by acoustic modes that do not exist in the final engine configuration. To address this issue, the present paper reports on active control of a subscale, atmospheric pressure nozzle/combustor arrangement. The fuel is natural gas. Cyclic injection of 14% control fuel in a premix fuel nozzle is shown to reduce oscillating pressure amplitude by a factor of 0.30 (i.e., ~10 dB) at 300 Hz. Measurement of the oscillating heat release is also reported.

16301 (DOE/PC/90094–T5) **Three-dimensional turbulent particle dispersion submodel development. Final report, 15 April 1991–15 April 1993.** Smith, P.J. Utah Univ., Salt Lake City, UT (United States). Dept. of Chemical Engineering. [1993]. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90094. Order Number DE95009663. Source: OSTI; NTIS; GPO Dep.

Many practical combustion processes which use solid particles, liquid droplets, or slurries as fuels introduce these fuels into turbulent environments. Examples include spray combustion, pulverized coal and coal slurry combustion, fluidized beds, sorbent injection, and hazardous waste incineration. The interactions of the condensed phases with turbulent environments in such applications have not been well described. Such a description is complicated by the difficulty of describing turbulence in general, even in the absence of particles or droplets. But the complications in describing the dispersion and reaction of the condensed phases in turbulent

environments do not stem entirely, or even primarily, from the uncertainties in the description of the turbulence. Even when the turbulence characteristics are known, computational methods for coupling the dynamics of the particulate phase with the continuous phase have not been well established. Several new theoretical descriptions of the turbulent dispersion of particles and droplets have been proposed over the past few years. It has been the purpose of this project to explore the potential of these theories for coupling with the other aspects of three-dimensional, reacting, turbulent, particle-laden systems, to provide computational simulations that could be useful for addressing industrial problems. Two different approaches were explored in this project. The major thrust of this project was on identifying a suitable dispersion submodel for dilute dispersed flows, implementing it in a comprehensive three-dimensional CFD code framework for combustion simulation and evaluating its performance rigorously. In another effort the potential of a dispersion submodel for densely loaded systems was analyzed. This report discusses the main issues that were resolved as part of this project.

16302 (NEI-DK–1961) **Pulsation phenomena and acoustic impedance conditions in larger gas-fueled boilers. Partial project I.** Energiministeriets Forskningsudvalg for produktion og fordeling af el og varme. Braendsler og forbraendingsteknik. Rasmussen, N.B.K. Dansk Gasteknisk Center A/S, Hoersholm (Denmark). Jan 1995. 112p. (In Danish). Contract ENS-1323/91-0002. Order Number DE95772386. Source: OSTI; NTIS.

EFP-91.

Conversion of a number of large boilers in central heating plants from oil fuels to natural gas can cause some problems with noise in the low frequency region. The so-called pulsation noise is due to acoustic oscillations of the burner, furnace and exhaust system, predominantly in the 0 - 100 Hz range. In some cases the narrow-band pulsation noise is so strong that the boiler has to be stopped. This partial project concerns an analysis of these pulsation phenomena in boilers. An exciter system for impedance measurements in the burner system is under construction. Measurement of impedance conditions of boilers and burners and calculation of the characteristic acoustic values for burner systems are the next step of this project. The method is tested on a boiler with confirmed noise problems and in boilers where the pulsation noise is provoked. Ability of the method to predict noise problems is being tested. (EG)

4220 Mining and Underground Engineering

Refer also to citation(s) 15008

16303 (SAND–95-0681C) **Geologic site characterization requirements for storage and mining in salt.** Neal, J.T. (Sandia National Labs., Albuquerque, NM (United States)); Magorian, T.R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505202–1: Solution Mining Research Institute spring meeting, New Orleans, LA (United States), 1 May 1995). Order Number DE95009866. Source: OSTI; NTIS; GPO Dep.

Geologic Site Characterization should be a dynamic, continuing process, not an event. Its successes and failures are legion and can make or break an operator. A balanced approach must be sought to provide adequate information for safety of operations, neither slighting nor overdoing the effort. The evolving nature of study methods and geologic knowledge essentially mandates that characterization efforts be reviewed periodically. However, indifference, nonchallance, and even outright disdain describe attitudes witnessed in some circles regarding this subject. Unawareness may also be a factor. Unfortunately, several unanticipated events have led to severe economic consequences for the operators. The hard-learned lessons involving several unanticipated geotechnical occurrences at several Gulf Coast salt domes are discussed. The ultimate benefit of valuing site characterization efforts may be more than just enhanced safety and health–costs not expended in lost facilities and litigation can become profit.

4230 Marine Engineering

16304 (NEI-DK–1888) **Evolution and kinetics of a modulated wave train by use of the boundary element method.** Skourup, J. (Danish Hydraulich Institute. Internation Research Centre for Computational Hydrodynamics, Hoersholm (Denmark)). Dansk Hydraulisk Inst., Hoersholm (Denmark). 1994. 10p. Contract ENS-1313/92-0007. (CONF-9408230–1: International symposium on waves - physical and numerical modelling, Vancouver (Canada), 21-24 Aug 1994). Order Number DE95766500. Source: OSTI; NTIS.

EFP-92.

A numerical method, based on a boundary integral equation combined with a non-linear time stepping procedure for the free water surface, is used for simulations of the evolution in time of a modulated wave train. The governing integral equation is based on Green's 2nd identity and the computations are performed in the physical domain. The kinematics in the fluid domain is determined and compared to the Stokes 5th order wave theory. The comparison is performed on the basis of the steepest wave that appears during the simulation. The results of two simulations are presented. In the first simulation the initial wave train evolves into one massive wave that breaks, whereas the second simulation evolves into a steep non-breaking wave, and thereafter a recurrence against the initial wave train takes place. (au)

16305 (NEI-DK–1889) **Note on sensitivity analysis for extreme crest heights.** Dansk Hydraulisk Inst., Hoersholm (Denmark). 1994. 6p. Contract ENS-1313/92-0007. Order Number DE95766503. Source: OSTI; NTIS.

EFP-92.

The measurements on waves in the Gorm oil field in the North Sea have been analysed in order to derive the 50-year extreme crest height based on the distribution of storms and the empirical distribution of the maximum crest height determined on the basis of 58 storms on record. Additional analyses have been made to determine extreme crests for longer recurrence periods and to assess the sensitivity of the 50-year value to variations in input data. (AB)

16306 (NEI-DK–1890) **Extreme waves in design.** Ottesen Hansen, N.E. Dansk Hydraulisk Inst., Hoersholm (Denmark); Lic Engineering A/S, Hellerup (Denmark). Dec 1994. 24p. Contract ENS-1313/92-0007. Order Number DE95766502. Source: OSTI; NTIS.

EFP-92.

This note comprises the conclusions of phase 5 of the research project: Extreme Waves (EFP'92, 1313/92-0007). The objectives of this phase are: to summarize the results reached in the research; to define procedures for applying extreme waves in the design of platforms; to define methods for determination of the frequency of occurence of extreme waves of the heights, the periods and the form of the crest. (au) (10 refs.)

16307 (NEI-DK–1891) **Wave group statistics for wave series containing extreme waves.** Lorenz, R.Z. Dansk Hydraulisk Inst., Hoersholm (Denmark); Lic Engineering A/S, Hellerup (Denmark). Oct 1993. 63p. Contract ENS-1313/92-0007. Order Number DE95766501. Source: OSTI; NTIS.

EFP-92.

The results of wave group statistics covering wave series with the 13 most important freak waves. The analysis includes zero-up - and zero-down crossing analysis of the wave series. Statistics for wave groups, based on several threshold wave heights, are determined. A comparison with Kimura's model for wave groups is given. The wave group analysis aims to find the distribution of wave groups and time interval between them to examine the wave groups for long period phenomenon and to examine the series of wave heights in the wave group for possible characteristic trends, especially for wave groups containing freak waves. The time series are plotted in a scale enough to examine individual waves, the current velocities are also plotted. The distribution of Run of high waves and the Total Run length follow, to a reasonable extent, Kimura's model. Wave height correlation between successive waves is high, between 0.29 and 0.53, with an average of 0.46. Wave grouping is pronounced. The surface elevation time series shows that the freak waves are mostly located in wave groups with

4-6 waves which are all higher than the significant wave height. Single freak waves are also seen. No characteristic form of the wave groups including freak waves is observed. The freak wave is seen in the beginning, at the end or in the middle of the group. In general the crest elevation of the freak waves are significantly higher and steeper than that of the neighbouring waves. The velocity censors places in elevation -5.6 m show that the particle velocities of the freak waves are only slightly higher than that of the neighbouring waves. (AB)

16308 (NEI-DK–1892) **Freak wave kinematics. Model test report.** Skourup, J. Dansk Hydraulisk Inst., Hoersholm (Denmark). Sep 1994. 76p. Contract ENS-1313/92-0007. Order Number DE95766504. Source: OSTI; NTIS.

EFP-92.

The aim of this study has been an attempt to reproduce, in the institute's offshore wave basin, freak waves measured at the Gorm Field (North Sea), measure the elevation and horizontal particle velocities and perform basic analyses of these with special emphasis on the wave crest regions. The reproductions are made both as 2D and 3D wave series. Freak waves from the period 1983 - 1985 are dealt with. The model tests were performed in a scale of 1:50. Five wave series including freak waves were selected for comprehensive model tests. The waves kept their general shape when reproduced in the institute's offshore basin, and the significant wave height was only slightly reduced. The extreme wave crest height was reduced by ca. 24% for the 2D, and 31% for the 3D, reproductions. The combined effect of chosen model scale and wave basin capabilities explain these reductions. Only wave components with frequencies (periods) within a limited interval can be reproduced due to physical constraints. The freak waves are found to possess a large amount of energy at very high frequencies above the limits for reproduction in the wave basin. The results from the model tests show that even with reduced crest heights, very high horizontal water particle velocities are present in the upper part of the reproduced freak waves, compared to what is found by using the Stokes fifth order wave theory based on the measured height and period of the freak waves. The high crest elevation does not necessarily appear in the reproduction point of the offshore basin. (au)

16309 (NEI-DK–1893) **Data reduction and basic analysis.** Skourup, J. Dansk Hydraulisk Inst., Hoersholm (Denmark); Lic Engineering A/S, Hellerup (Denmark). May 1994. 36p. Contract ENS-1313/92-0007. Order Number DE95766505. Source: OSTI; NTIS.

EFP-92.

Wave data from the Gorm oil field in the Danish sector of the North Sea are analyzed in order to find freak waves. Simple criteria are used to identify freak waves and an assessment of candidates is based on visual inspection of time series plots.(AB)

16310 (NEI-DK–1909) **Extreme crest heights.** Dansk Hydraulisk Inst., Hoersholm (Denmark). Aug 1994. 10p. Contract ENS-1313/92-0007. Order Number DE95766495. Source: OSTI; NTIS.

EFP-92.

Wave crests have been analyzed in order to establish a design value applicable to air gap assessments etc. A description of the data, analyses and results are given. The data derives from sea-state information gathered from the analysis of data measured during the period 1966-93. Radar equipment has recorded waves at a rate of 2 Hz during storm conditions. Crest height has been determined using the water level found as an average over the duration of the storm. This information has proved useful for the determination of extreme waves and crests. For each storm this procedure has yielded the maximum crest height relative to the mean sea level during the storm resulting in a total of 58 crest heights. A considerable degree of uncertainty pertains to the determination of Mean Water Level, which naturally influences the measurement of crest height values relative to it. Results of the statistical analysis of all maximum crest heights is that a wave crest height of 14.6 m above Mean Water Level is exceeded once in 50 years in this area. (AB)

16311 (NEI-NO–500) **Technology as a driving force.** Torvund, T. (Norsk Hydro A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 30p. (CONF-9408229–7: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766576. Source: OSTI; NTIS; INIS.

The competitiveness of the Norwegian Continental shelf has been put firmly on the agenda in Norway since the report from a working group set up by the Ministry of Industry and Energy was released in February this year. If there is to be secured a long future for oil and gas activities, a reduction in the time and costs used in the projects of the order of 40-50%, without jeopardizing the high safety and environmental standards achieved in Norway. The paper addresses how technology can be a driving force in achieving these aims. But technology alone cannot do the job. Progress and changes in several other areas are also necessary, and the new scenario also calls for improved relations between all actors in the North Sea, authorities, oil companies, contractors and labour unions. 15 figs.

16312 (NEI-NO–501) **New approaches to cost reduction on the UK continental shelf.** Curtis, M.I. Norsk Petroleumsforening, Oslo (Norway). 1994. 33p. (CONF-9408229–8: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766577. Source: OSTI; NTIS; INIS.

The conference paper deals with cost reduction on the UK continental shelf. New approaches on the reduction of field development costs are compared with the cases if traditional approaches had been followed. Field developments where success in aligning the goals and objectives of the contractors and owners which led to projects being delivered on time but more than 20% below budget, are exemplified. The contractors in the alliance received 55% of the savings in addition to their normal profit. The procedure to follow in such cases, is discussed.

16313 (NEI-NO–503) **How to create a win-win situation between the oil companies and the contractors/suppliers.** Bergersen, T. (Aker Oil and Gas Technology (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 5p. (CONF-9408229–10: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766579. Source: OSTI; NTIS.

The conference paper deals with the obtained experience in Norway on contract management offshore. The paper discusses the issue of new ideas with the aim of creating a win-win situation and to obtain simplified contracts. Two main areas are discussed. Firstly, how to create a business environment where conflicts are less likely to occur, and secondly, how to handle conflicts efficiently when they occur.

16314 (NEI-NO–520) **Responding to cost efficiency requirements in offshore project.** Nilsen, G. Brustad (ABB Offshore Technology A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 7p. (CONF-9408229–27: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766596. Source: OSTI; NTIS.

The conference paper focuses on the subsea system and the cost effective scheme of the planned Norwegian Vigdis field development encompassing the well system, protective structures, control systems, and umbilicals. In order to achieve the overall goal of cost effective solutions, focus has been put on a concept based upon suppliers standard products and technology, re-use of available tools and equipment, and new models for project execution. Cost reductions have been in the order of 20-50%.

16315 (NEI-NO–521) **Cost efficient solutions for marginal field developments.** Forbes, G.A. (Norske Veritas Industry, VERITEC, Stavanger (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 28p. (CONF-9408229–28: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766597. Source: OSTI; NTIS.

Cost effectiveness as a means to improve development prospects for marginal fields is very topical. This paper focuses on

some methods currently available. Topics discussed are: Historical and cultural aspects; cost influence; contracting strategy; project organization; performance measurement and improvement; responsibility and interfaces; system packaging; functional system specifications and orders; information management. 20 figs.

16316 (NEI-NO–524) **Deep water field development.** Vance, G.P. (Mobil Research and Development Corp. (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 14p. (CONF-9408229–31: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766600. Source: OSTI; NTIS.

The conference paper discusses the cost of field developments in deep water areas. Some of the major international oil companies have estimated that 50% of their future reserves are in water depths greater than 1000 feet. Studies have shown that deep water fields can be economically developed, with capital costs in the order of $2 to $3 per barrel, drilling costs in the order of $2 to $3 per barrel, and operating costs in the order of $2 to $4 per barrel. The cost would increase some 70-80% by going from about 1000 feet to 4000 feet. The paper illustrates and discusses the future demand of new technologies to be developed. 9 figs.

16317 (NEI-NO–525) **FPSO and TLP deepwater station-keeping systems. Problems and solutions.** D'Souza, R.B. (Aker Omega, Inc. (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 19p. (CONF-9408229–32: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766601. Source: OSTI; NTIS.

The conference paper focuses on deepwater station-keeping systems for FPSO's (Floating Production Storage and Offloading Systems) and TLP's (Tension Leg Platforms). It reviews the state-of-practice and highlights design and cost drivers. Key technology issues and challenges related to analysis, design, equipment, materials and installation are addressed. Finally, areas and ideas that hold significant promise for major cost reductions are discussed. 20 refs., 13 figs., 2 tabs.

16318 (NEI-NO–526) **Riser design options.** Fisher, E.A. (Cooper Industries (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 5p. (CONF-9408229–33: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766602. Source: OSTI; NTIS.

The major part of this paper is based on a production riser system used in the Gulf of Mexico. The original philosophy was to design a system for small marginal fields that could drain a reservoir and then be moved on to a second or even a third location. The system was sized to support 24 wells with a peak production of 45.000 barrels of oil and 120.000.000 cubic feet of gas per day. The economics of this system are excellent, especially compared to much larger installations with similar production rates.

16319 (NEI-NO–527) **The flexible riser option.** Narzul, P. (Coflexip Norge A/S (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 11p. (CONF-9408229–34: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766603. Source: OSTI; NTIS.

The conference paper deals with the flexible riser option and challenges in deepwater areas between 1.000 and 2.000 m. Topics are: Challenges of high static top tensions; challenges of high hydrostatic pressures; dynamic aspects and fatigue; installation aspects; floater interface; why flexible risers. 4 refs., 5 figs.

16320 (NEI-NO–528) **Turret moored systems approach.** Baadshaug, O. (Kvaerner Engineering A/S (Norway)); Gulbrandsen, H. Norsk Petroleumsforening, Oslo (Norway). 1994. 24p. (CONF-9408229–35: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766604. Source: OSTI; NTIS.

The development of oil and gas fields in very deep waters will be performed by utilizing floating production units with probably extensive use of subsea developments. Candidate substructures for deepwater developments are TLPs (Tension Leg Platforms), deep draft floaters, semi submersibles, turret moored systems, and possible new concepts. The authors of this paper will focus on turret moored systems (production ships). The system includes production, storage and offloading in one single system, hence all elements except for drilling can be performed from the same unit. Offshore storage and offloading will often be required due to expected lack of infrastructure and pipelines. A special feature is the weather-vaning capability which gives significantly reduced environmental forces compared to other concepts. This feature makes it possible to reduce mooring line weights and consequently the costs. Another factor is to fabricate the substructure (hull) with utility systems at ship yards using the standard ship production line. 10 figs., 1 tab.

16321 (NEI-NO–529) **Floating production: Future requirements.** Kenison, R. (British Petroleum (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 18p. (CONF-9408229–36: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766605. Source: OSTI; NTIS.

The conference paper deals with future requirements of floating production systems. The North Sea area has seen many applications successfully used for many years. Floating production facilities are able to offer effective life of field facility for developing large fields in a range of water depths in direct competition to the traditional structures used to date. The paper addresses the context in which floating production units can be considered, what business influences will deliver improved performances and the possibility of wider applications. Floating production can offer the benefits of fast pace and flexibility of design throughputs which alternative concepts cannot offer. The theme of the paper is flexibility and pace. 9 figs.

16322 (NEI-NO–530) **The role of the floaters. Designing for larger topside facilities.** Eriksson, J.G. (Kvaerner Engineering A/S, Oslo (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 16p. (CONF-9408229–37: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766606. Source: OSTI; NTIS.

The conference paper discusses larger topside facilities offshore. Topics are: Challenges to the industry; key issues; principal applications of floaters; types of floaters, overview; topside functional requirements; topside design objectives; features of floater topsides, design challenges; improvements to the design process; improvements to project execution models; development ideas. 2 tabs.

16323 (NEI-NO–534) **Designing for efficient installation and intervention.** Halvorsen, T. (Kongsberg Offshore (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 9p. (CONF-9408229–41: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766610. Source: OSTI; NTIS.

EPC type contracts have led to an integration of the various systems to lower the cost of the combined equipment package with only limited focus on the installation and intervention cost. As installation and intervention represent a major part of the total well cost, it is a natural step to optimize the total cost for equipment and installation. Successful delivery and installation of Draugen, SSP and Heidrun subsea wells have provided an excellent experience base for designing cost efficient subsea systems, integrating equipment and installation to minimize the total subsea well cost. The paper presents the experience gained from these projects, and how this experience has been used in the development of the next generation subsea systems.

16324 (NEI-NO–535) **A case for standardisation of subsea technology.** Garnham, D. (Cooper Oil Tool, Leeds (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 13p. (CONF-9408229–42: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766611. Source: OSTI; NTIS.

The conference paper deals with the standard-based subsea technology. Typically the developers will have to cater for deep water, high temperature and high pressure. In fact with the increased cost of working in deeper water and more inclement weather,

Capex and Opex cost of subsea trees will be critical in the overall cost analysis which is developed to determine a field's viability. The paper discusses the modular Matrix subsea tree system being developed besides the future requirement of three functional types of trees which include production trees, water injection trees and gas lift trees. 4 figs.

16325 (NEI-NO–536) **Advances in drilling and completion technology.** Garcia, J.A. (Exxon Co. International (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 14p. (CONF-9408229–43: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766612. Source: OSTI; NTIS.

The conference paper deals with notable areas of improvement on advanced drilling and completion technology. Following areas are discussed: Wellbore stability, where the value of high-potassium mud systems and quantified prediction of wellbore failure is recognized; drilling fluids, with the introduction of biodegradable pseudo-oil-base muds and an effective lubricity additive for water-base muds; drilling equipment and operating procedures, including larger drill pipe and more reliable motors and MWD tools; MWD logging, where better tools and more sophisticated analysis are closing the gap with wireline logging; completion technology, including sand control for long horizontal wells. Additional progress is desired in many areas such as water-base muds, prediction of sand production, and disposal of well-test fluids. 14 refs., 2 figs., 1 tab.

16326 (NEI-NO–544) **Applying J-curve techniques for deep water pipelines.** Springmann, S.P. (McDermott Marine Construction (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 10p. (CONF-9408229–51: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766620. Source: OSTI; NTIS.

The conference paper deals with pipelaying techniques in the Vermilion and Eugene Island Areas, Offshore Louisiana. As part of the planned offshore installation of the respective 12 inches oil and gas pipelines connecting the Auger Tension Leg Platform (TLP) to two shallow water platforms, Shell Oil Company required the use of J-Lay pipelaying techniques for the installation of the Phase II deepwater portions of the Auger pipelines ranging from water depths of 1200 to 2860 feet. The paper describes the J-Lay Pipelay System utilized to install the deepwater portions of the Auger 12 inches pipelines and the means by which pre-fabricated pipe joints were assembled, handled, and installed utilizing J-lay methods and techniques. As evidenced by the successful installation of the Auger pipelines, this new technology provides proven, reliable methods in which deepwater pipelaying operations can be performed beyond the limits of conventionally moored S-Lay Reel-Lay pipelaying vessels. 2 refs., 5 figs.

16327 (NEI-NO–545) **Laying the worlds deepest pipeline, lessons learned.** Hotchkiss, B. (Stena Offshore (United Kingdom)). Norsk Petroleumsforening, Oslo (Norway). 1994. 12p. (CONF-9408229–52: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766621. Source: OSTI; NTIS.

The conference paper addresses the success of the comparatively recent development of J-lay with respect to deep water pipelay. In laying the world deepest rigid pipeline in Brazil, there was utilized a tool which was built in 1979 when the flowline industry generally did not exist. The installation vessel, the reel vessel Stene Apache, did require modification to its pipelaying equipment and support services. These modifications were not radical and were part of an ongoing upgrade of capability based on requirement, i.e. market forces, to meet the needs of the day. To address the subject matter, it is perhaps important to refer to the installation programme in Brazil 1992 when the deepest rigid pipeline of the time was installed by Apache, this was a 10 inch pipe at 705 metre depth. When returning to Brazil in 1994 to install 12 inch pipe to a new record depth of 886 metres, certain changes to equipment and procedures were implemented based upon the previous experience. 4 figs.

16328 (NEI-NO–546) **J-lay welding production improvement program.** Hirsch, D.J. (PCI Energy Services, Lake Bluff, IL (United States)). Norsk Petroleumsforening, Oslo (Norway). 1994. 7p. (CONF-9408229–53: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766622. Source: OSTI; NTIS.

The conference paper deals with the specific requirements of J-lay pipe welding merit detailed study. Special emphasis needs to be placed on the variables controlling welding and inspection productivity to provide economic J-lay pipelay techniques. A program was undertaken to make initial efforts to identify and improve those variables. 4 refs., 2 figs.

4260 Components, Electron Devices and Circuits

Refer also to citation(s) 15796, 15797, 16777, 17395

16329 (IFVE-OEA–93-145) **Coding systems in the laser photo plotter of raster type.** Bufan, A.M.; Ivanov, A.A.; Ivanov, A.An.; Morozov, A.F.; Nechaev, Yu.C. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 7p. (In Russian). Order Number DE95628813. Source: OSTI; NTIS (US Sales Only); INIS.

The systems of the coding of angular position of the laser beam in the laser photo plotter of raster type are described. The coding along the X-axis is carried out with the reference grid and the laser interferometer is used to detect the mirror angle position along the Y-axis. In addition the coding of coordinates corresponding to the center of the video signal when the laser beam intersects any cross legs on the etalon glass is provided. 2 refs., 3 figs.

16330 **Method for spatially uniform electroplating and apparatus therefor.** Mayer, S.T.; Contolini, R.J. To Dept. of Energy. 1993. Filed date 30 Mar 1993. U.S. Patent Application 8-039,677. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009993. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Pulsed voltage is used in a flow electroplating cell for achieving spatially uniform electrodeposits. The method includes placing the sample in an electrolyte cell having an electrode, flowing an electrolyte on the sample, applying a voltage between the sample and the electrode, and controlling a voltage according to prespecified, multi-level pulsed waveform during the step of flowing an electrolyte on the sample. The electroplating is further enhanced by rotating the sample while flowing the electrolyte on the sample. An electrolyte bath is filled during use to an operating level of electrolyte. An electrolyte flow channel is provided within the bath, providing a flow channel upward from the bottom of the bath toward the operating level. A reference electrode is placed in the electrolyte bath in electrical contact with the electrolyte during use. A porous counter electrode is mounted over the electrolyte flow channel, so that electrolyte from the flow port flows through the electrode into the bath at a level below the operating level. A mount for a sample to be plated is included which mounts the sample over the counter electrode so that the surface of the sample having a feature to be electroplated is below the operating level of the bath and above the counter electrode, completely immersed in the electrolyte.

16331 (PNL–10478) **The potential for microtechnology applications in energy systems: Results of an experts workshop.** Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009103. Source: OSTI; NTIS; GPO Dep.

Microscale technologies, or microelectromechanical systems (MEMS), are currently under development in the United States and abroad. Examples include microsensors, microactuators (including micromotors), and microscale heat exchangers. Typically, microscale devices have features ranging in size from a few microns to several millimeters, with fabrication methods adapted from those developed for the semiconductor industry. Microtechnologies are already being commercialized; initial markets include the biomedical and transportation industries. Applications are being developed in other industries as well. Researchers at the Pacific Northwest Laboratory (PNL) hypothesize that a significant number of energy

applications are possible. These applications range from environmental sensors that support enhanced control of building (or room) temperature and ventilation to microscale heat pumps and microscale heat engines that could collectively provide for kilowatt quantities of energy conversion. If efficient versions of these devices are developed, they could significantly advance the commercialization of distributed energy conversion systems, thereby reducing the energy losses associated with energy distribution. Based upon the potential for energy savings, the U.S. Department of Energy (DOE) Office of Building Technologies (OBT) has proposed a new initiative in energy systems miniaturization. The program would focus on the development of microtechnologies for the manufactured housing sector and would begin in either FY 1997 or FY 1998, ramping up to $5 million per year investment by FY 2001.

16332 (SAND–94-0252C) **Spotsize measurements of a focused CW Nd:YAG laser.** Essien, M.; Schanwald, L.P.; Fuerschbach, P.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–20: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95007746. Source: OSTI; NTIS; GPO Dep.

The minimum spotsize, beam quality or M^2, and Strehl ratio of a focused laser beam provide different measures of the performance of the laser/optic system. Focusing lenses typically used to provide irradiances sufficient to cause melting and/or vaporization of metals or ceramics typically exhibit considerable spherical aberration, and thus limit the minimum spotsize attainable for a given lens at a specific laser power. The purpose of this work is to quantify the increase in the minimum spotsize and decrease in Strehl ratio of a focused materials processing CW Nd:YAG laser caused by laser cavity heating and spherical aberration introduced by the focusing lens. Minimum spotsize was determined by making several measurements of spotsize along the propagation direction using a scanning aperture system, and fitting the data to the laser propagation equation. These measurements were performed for 6 plano-convex lenses of different focal lengths, using laser powers ranging from 500 to 1500 watts. A nonlinear variation of spotsize with laser power and with focal length was observed for the lenses and power levels tested.

16333 (SAND–94-2169C) **Fractal quantum well heterostructures for broadband light emitters.** Crawford, M.H.; Gourley, P.L.; Meissner, K.E.; Sinclair, M.B.; Jones, E.D.; Chow, W.W.; Schneider, R.P. Jr. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950226–31: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95009579. Source: OSTI; NTIS; GPO Dep.

We examine carrier relaxation and radiative recombination in AlGaAs based near IR and AlGaInP based visible fractal quantum well heterostructures. Through temperature dependent photoluminescence, we demonstrate that enhanced population of higher lying energy levels can be achieved by varying the thickness of the layers in the fractal heterostructurd. This distribution of carriers results in room temperature emission over a relatively broad range of wavelengths: approximately 700–855 nm for AlGaAs structures and 575–650 nm for AlGaInP structures. Spectra are compared to theoretical calculations to evaluate the non-equilibrium nature of the carrier distributions. Time resolved photoluminescence measurements demonstrate an approximately linear relationship between the radiative decay time and the layer thickness of the structure. Correspondingly, integrated luminescence measurements at room temperature reveal a factor of four increase in the light output efficiency of the structure as the fractal layer thickness is increased from 50 Å to 400 Å. The applicability of these heterostructures to broadband LEDs is discussed.

16334 (SAND–94-2619C) **Defect centers in chemical-mechanical polished MOS oxides.** Shaneyfelt, M.R.; Warren, W.L.; Hetherington, D.L.; Timon, R.P.; Resnick, P.J.; Winokur, P.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9506105–1: INFOS '95: insulating films on semiconductors conference, Grenoble (France), 7-10 Jun 1995). Order Number DE95004777. Source: OSTI; NTIS; INIS; GPO Dep.

Defect centers generated in vacuum-ultraviolet irradiated chemical-mechanical polished oxides have been characterized using electron paramagnetic resonance and C-V analysis. Both oxide trap E_γ and interface trap P_{b0} centers were detected in unpolished and polished oxides. In addition, another interface defect center known as the P_{b1} center was only identified in the polished oxides, suggesting that the polishing process altered the SiO_2/Si interface.

16335 (SAND–95-0573C) **Intermetallic compound layer growth kinetics in non-lead bearing solders.** Vianco, P.T.; Kilgo, A.C.; Grant, R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503119–2: ECM '95 conference, Las Cruces, NM (United States), 12-15 Mar 1995). Order Number DE95009595. Source: OSTI; NTIS; GPO Dep.

The introduction of alternative, non-lead bearing solders into electronic assemblies requires a thorough investigation of product manufacturability and reliability. Both of these attributes can be impacted by the excessive growth of intermetallic compound (IMC) layers at the solder/substrate interface. An extensive study has documented the stoichiometry and solid state growth kinetics of IMC layers formed between copper and the lead-free solders: 96.5Sn-3.5Ag (wt.%), 95Sn-5Sb, 100Sn, and 58Bi-42Sn. Aging temperatures were 70–205 C for the Sn-based solders and 55–120 C for the Bi-rich solder. Time periods were 1–400 days for all of the alloys. The Sn/Cu, Sn-Ag/Cu, and Sn-Sb/Cu IMC layers exhibited sub-layers of Cu_6Sn_5 and Cu_3Sn; the latter composition was present only following prolonged aging times or higher temperatures. The total layer growth exhibited a time exponent of $n = 0.5$ at low temperatures and a value of $n = 0.42$ at higher temperatures in each of the solder/Cu systems. Similar growth kinetics were observed with the low temperature 58Bi-42Sn solder; however, a considerably more complex sub-layer structure was observed. The kinetic data will be discussed with respect to predicting IMC layer growth based upon solder composition.

16336 (UCRL-JC–118408) **Femtosecond, Cr^{4+}:YAG laser.** Nathel, H. (Lawrence Livermore National Lab., CA (United States)); Sennaroglu, A.; Pollock, C.R. Lawrence Livermore National Lab., CA (United States). Aug 1994. 2p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Joint Services Electronics Program (United States);Cornell Univ., Ithaca, NY (United States). DOE Contract W-7405-ENG-48. Grant ECS-9111838. (CONF-9405308–1: 9. ultra short phenomenon, Heidelberg (Germany), 2-5 May 1994). Order Number DE95004964. Source: OSTI; NTIS; GPO Dep.

Results from both a regeneratively-initiated and self-initiated, mode-locked CR.YAG laser which is tunable from 1.51 to 1.53 μm are reported. One hundred and twenty femtosecond, nearly transform-limited pulses have been generated with peak output powers of 45 kW. The stable, high peak power pulses and room temperature operation of this laser make it a very suitable alternative to the cumbersome, cryogenic mode-locked NaCl laser commonly used in both narrow bandgap semiconductor and optical communications research.

43 PARTICLE ACCELERATORS

Refer also to citation(s) 15677, 16264, 16265

4301 Design, Development, and Operation

Refer also to citation(s) 15004, 15005, 15218, 16236, 16436, 16758, 17264

16337 (BNL–61149, pp. 12-19) **RF linacs for radioisotope production.** Hamm, R.W. (AccSys Technology, Inc., Pleasanton,

CA (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

This paper is an update on the development of the rf linacs for radioisotope production first described in the accelerator roundtable presentations at the Third Targetry Workshop in Vancouver, Canada. These compact ion accelerators, now possible because of the development of the Radio Frequency Quadrupole (RFQ), can provide high currents of protons, deuterons, or helium ions from energies of a few MeV up to 100 MeV. Several of the rf linacs described in Vancouver have now been designed and developed for PET radionuclide production, showing their obvious advantages over other accelerator technology in size, weight and shielding requirements. Based on the results from these prototype systems, a design has now been completed for a 7 MeV proton linac that, when coupled to the new targets being developed, can supply all four PET radionuclides (^{11}C, ^{13}N, ^{15}O, and ^{18}F) in adequate quantities for clinical studies. This accelerator will require little or no shielding when the proton beam is delivered to a compact shielded target assembly, making it capable of being placed virtually anywhere in a hospital or clinic.

16338 (BNL–61149, pp. 20-29) **^{3}He RFQ for PET isotope production: A UW/SAIC progress report.** Krohn, K.A. (Univ. of Washington, Seattle, WA (United States)); Link, J.M.; Weitkamp, W.G.; Hagan, W.K.; Young, P. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A broad agency announcement by the Strategic Defense Initiative of the US Department of Defense ("Star Wars") in 1988 requested proposals to apply new accelerator technology being developed for the military for alternative uses in medical research. The proposals were to be evaluated on issues such as cost, weight, simplicity, control systems, and targetry. This report describes one such project proposed jointly by Science Applications International Corporation (accelerator design and development), the University of Washington (targetry development) and Scanditronix (manufacturing). SDIO funding for miniaturized accelerators for PET was awarded in November 1989. Two different projects were funded: Science Research Laboratories and Washington University (St. Louis) to develop the tandem cascade accelerator and this group to develop the 8 MeV ^{3}He RFQ.

16339 (BNL–61149, pp. 30-32) **An ultra-compact ^{13}N-ammonia generator.** Klinkowstein, R.E. (Science Research Lab., Inc., Somerville, MA (United States)); Shefer, R.E.; Hughey, B.J.; Welch, M.J.; Mallinckrodt. Brookhaven National Lab., Upton, NY (United States). 1994. Grant 1R43HL48969; Grant 2R44CA53953; Contract SDI084-89-C-0049. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A dedicated, accelerator-based ^{13}N-ammonia generator capable of providing multiple 30 mCi batches of $^{13}NH_3$ for clinical use is under development at Science Research Laboratory, Inc. (SRL). The system utilizes a very low energy (1.2 MeV) coaxial cascade accelerator (CCA) to produce ^{13}N-ammonia via the $^{12}C(d,n)^{13}N$ nuclear reaction in a solid graphite target. The ^{13}N production target designed for this system is windowless and allows in-situ extraction of activity via combustion of the graphite, as described in an accompanying paper. The authors have tested a prototype target using an existing deuteron accelerator at SRL and have shown that the target is reusable for multiple irradiation and extraction cycles. New target processing techniques developed at SRL and Washington University allow the extraction and conversion of target activity to ^{13}N-ammonia in under 10 minutes with a total decay-corrected efficiency of 44%. Using these techniques, a batch yield of 30 mCi of $^{13}NH_3$ may be obtained from an EOB target yield of 136 mCi of ^{13}N-ammonia. The authors have measured the thick target yield from the $^{12}C(d,n)^{13}N$ reaction on graphite at low deuteron bombarding energies and have found that the saturated yield at 1.2 MeV is 0.85 mCi/μA. A deuteron beam current of approximately 215 μA will therefore provide the required target yield in a 20 minute irradiation time.

16340 (BNL–61149, pp. 33-37) **Progress report on the TR13.** Ruth, T.J.; Buckley, K. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The TR13 is a 13 Me cyclotron is a developed jointly by TRIUMF and Ebco Technologies of Richmond, BC under a technology transfer agreement. The cyclotron is designed as an integrated facility consisting of a cyclotron, target changer, targets, local shielding and product transfer systems. The design reflects more than eight years experience with the CP42 cyclotron facility, two years with the TR30 (another joint effort between TRIUMPH and Ebco) and state-of-the-art cyclotron technology. The main features that are responsible for high productivity and low radiation exposure are: the cyclotron has an external ion source capable of producing a much higher beam current than an internal source. The high gas flow, required to run the source, does not adversely affect vacuum in the cyclotron due to differential pumping between source and cyclotron. Therefore activation of the machine due to gas stripping is very low. Low beam energy to minimize reaction pathways causing parts activation. Localized modular shielding around most radioactive components. Because of the low energy and minimal beam loss the cyclotron and targets do not need a separate shielded vault when outfitted with the localized shielding.

16341 (BNL–61149, pp. 38-43) **Superconducting cyclotron for clinical PET.** Tanaka, Masahiro (NKK Corp., Tokyo (Japan)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

As PET has become more popular, there have been growing needs for an easily operational cyclotron and chemistry system. Not many hospitals want to keep a full set of operators: a cyclotron operator, a chemistry module operator and a scanner operator. When producing ammonia or fluoro deoxy glucose (FDG) for example, a cyclotron should be operated by a chemistry module operator. When performing an [^{15}O] gas study, it should be operated by a scanner operator or even by a doctor. Therefore the bases for developing the cyclotron, the targets and the chemistry modules have been: (1) Simple operation; (2) High reliability; and (3) Easy maintenance. The authors have installed the cyclotron and chemistry systems at Hyogo Institute for Aging Brain and Cognitive Disorder and Osaka City University. This paper introduces the outline of the system with a detail of [^{13}N] ammonia production.

16342 (BNL–61149, pp. 364) **The BLIP Upgrade Project.** Mausner, L.F. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

This $6M BLIP construction project, funded by the DOE Office of Energy Research for a Fiscal Year 1994 start, is anticipated to be complete in June 1996. The purpose of the BLIP Upgrade Project is to reverse the erosion in radionuclide production capability and availability that has occurred at BNL to enable BLIP to serve as a reliable source of selected radionuclides in the interim until the NBTF comes on line. The project goals are to increase the proton beam current from 50 μA to 145 μA, improve BLIP/LINAC reliability, and enhance processing facilities to handle the higher levels of radioactivity expected. Finally, to improve radionuclide supply the authors propose to run the facility up to 46 weeks per year with

90% beam availability (1.5d/month maintenance = 5% + 5% downtime). At this point there is no commitment from either the Office of Energy Research or the Office of Nuclear Energy to provide the necessary operating funds. The specific facility modifications are summarized.

16343 (CONF-9410294–4) **Status report on the Holifield Radioactive Ion Beam Project.** Meigs, M.J. (and others); Alton, G.D.; Auble, R.L. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1994 symposium of the North Eastern Accelerator personnel (SNEAP-94); Kalamazoo, MI (United States); 12-15 Oct 1994. Order Number DE95009128. Source: OSTI; NTIS; INIS; GPO Dep.

In July 1992, a project was started to reconfigure the Holifield Heavy Ion Research Facility (HHIRF) to form the Holifield Radioactive Ion Beam Facility (HRIBF). This ORNL project to produce medium-intensity, proton-rich, radioactive ion beams (RIBS) for astrophysics, nuclear physics, and applied research was first described to the SNEAP community at Chalk River in 1992. To briefly review, radioactive ions will be produced by light ion beams from the Oak Ridge Isochronous Cyclotron (ORIC) striking a target in an Isotope Separator On-Line (ISOL)-type target-ion source assembly. The radioactive ions will be converted to negative ions either directly in the ion source or by charge exchange following positive ionization. After acceleration to approximately 300 keV, these ions will be injected into the tandem accelerator for acceleration to higher energies. Successful production and acceleration of RIBs requires changes in the existing accelerators, development of the target-ion source, and construction of a new high-voltage injector and new injection beam line for the tandem accelerator. A floor plan of the facility as it should be when the project is finished is given. Progress has been made in a areas and will be detailed starting with the cyclotron.

16344 (ENEA-RT-INN–94-20) **Preliminary design of technologically advanced and compact synchrotron for proton therapy.** Picardi, L. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Ronsivalle, C.; Vignati, A.; Silvestrov, G.; Vsevolozskhaya, T.; Bartolini, R. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1994. 64p. (RT/INN–94-20). Order Number DE95771055. Source: OSTI; NTIS (US Sales Only).

This paper describes the activity on optimising the parameters of a compact protosynchrotron in the energy range of 80-200 MeV. Based on the 200-MeV protosynchrotron under development at the Budker Institute for Nuclear Physics at Novosibirsk, the work was stimulated by the Italian 'Progetto Adroterapia' whose aim is to diffuse cancer therapy with protons and ions. The innovative aspect of the project is the use of 4-Tesla warm pulsed dipole magnets that allow an accelerator diameter of the order of 2 meters, thus permitting the machine to be transported pre-assembled.

16345 (FNAL-TM–1901) **Modelling the Fermilab Collider to determine optimal running.** McCrory, E. Fermi National Accelerator Lab., Batavia, IL (United States). Dec 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95005756. Source: OSTI; NTIS; INIS; GPO Dep.

A Monte Carlo-type model of the Fermilab Collider has been constructed, the goal of which is to accurately represent the operation of the Collider, incorporating the aspects of the facility which affect operations in order to determine how to run optimally. In particular, downtime for the various parts of the complex are parameterized and included. Also, transfer efficiencies, emittance growths, changes in the luminosity lifetime and other effects are included and randomized in a reasonable manner. This Memo is an outgrowth of TM-1878, which presented an entirely analytical model of the Collider. It produced a framework for developing intuition on the way in which the major components of the collider affect the luminosity, like the stacking rate and the shot set-up time, for example. However, without accurately including downtime effects, it is not possible to say with certainty that the analytical approach can produce accurate guidelines for optimizing the performance of the Collider. This is the goal of this analysis. We first discuss the way the model is written, describing the object-oriented approach taken in C++. The parameters of the simulation are described. Then the potential criteria for ending stores are described and analyzed. Next, a typical store and a typical week are derived. Then, a final conclusion on the best end-of-store criterion is made. Finally, ideas for future analysis are presented.

16346 (INIS-mf–14483, pp. 43-48) **0.9 MV accelerator for materials research at the Slovak Technical University, Bratislava.** Pavlovic, M. (Slovenska Vysoka Skola Technicka, Bratislava (Slovakia). Elektrotechnicka Fakulta); Dobrovodsky, J.; Kovac, P.; Vitazek, K. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

A description is given of the reconstructed linear electrostatic accelerator and the possibilities outlined of its use and future improvements. Optical properties of the accelerator tube were optimized; a special non-homogeneous potential contribution was found which allows the application of high voltage within the range of 50 to 900 kV. 900 kV was found to be the optimum voltage for the accelerator performance. A brief description of the accelerator and its performance is given. (Z.S.) 2 figs., 9 refs.

16347 (INP–1672/AP) **AIC-144 S isochronous cyclotron conversion for medicine and other applications (60 MeV p).** Schwabe, J. (Institute of Nuclear Physics, Cracow (Poland)); Balmas, A.; Godunowa, H. Institute of Nuclear Physics, Cracow (Poland). Apr 1994. 12p. Order Number DE95628722. Source: OSTI; NTIS; INIS.

Modification of AIC-144 S isochronous cyclotron were aimed et increasing the maximum energy of protons up to 60 MeV, and minimizing excitation power losses of resonator cavity. They have been attained by increasing the value of average magnetic field up to 18.2 kGs on the extraction radium (62.5 cm) and by extending to the upper band of RF generator frequency from 24.8 MHz to 26.1 MHz and obtaining the conditions for the cavity tuning in this frequency. These modifications were cheap and single. (author). 2 refs, 7 figs, 3 tabs.

16348 (JINR-E–3-94-128) **International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.** Pepelyshev, Yu.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 34p. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

A conceptual design of creating intense pulsed neutron sources based on high-current accelerators and pulsed reactors for neutron scattering experiments is considered. The progress in high-efficiency moderator developments is shown. Results of diffraction studied are presented.

16349 (JINR-E–3-94-128, pp. 6) **Pulsed neutron sources for physical research.** Stavissky, Yu.Ya. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/accelerators; NEUTRON SOURCES/proton beams; BEAM CURRENTS; EFFICIENCY; FEASIBILITY STUDIES; ACCELERATORS; PULSED NEUTRON TECHNIQUES

16350 (JINR-E–3-94-128, pp. 18) **Advanced neutron source for physical research.** Senichev, Yu.V.; Stavissky, Yu.Ya. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited*

talks. 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/pulsed neutron techniques; BISMUTH; GEV RANGE 01-10; LEAD; LIQUID METAL FUELS; NEUTRON FLUX; PROTON BEAMS; SOLIDS; TARGETS; THERMAL NEUTRONS

16351 (JINR-E–3-94-128, pp. 23) **High-intensity neutron source on the basis of powerful pulsed electron accelerator LIU-30 and pulsed nuclear reactor BR-1.** Bosamykin, V.S. (and others); Koshelev, A.S.; Gerasimov, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/linear accelerators; NEUTRON SOURCES/pulsed reactors; NEUTRON FLUX; OPERATION; TARGETS; TUNGSTEN

16352 (JINR-E–3-94-128, pp. 24) **On investigation of the possibility of creating a pulsed neutron source based on a powerful electron accelerator and a pulsed nuclear reactor.** Bosamykin, V.S. (and others); Voinov, M.A.; Gordeyev, V.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/linear accelerators; NEUTRON SOURCES/pulsed reactors; KILO AMP BEAM CURRENTS; MEV RANGE 10-100; NEUTRON FLUX

16353 (LA-UR–95-631) **APT cost scaling: Preliminary indications from a Parametric Costing Model (PCM).** Krakowski, R.A. Los Alamos National Lab., NM (United States). 3 Feb 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007859. Source: OSTI; NTIS; INIS; GPO Dep.

A Parametric Costing Model has been created and evaluate as a first step in quantitatively understanding important design options for the Accelerator Production of Tritium (APT) concept. This model couples key economic and technical elements of APT in a two-parameter search of beam energy and beam power that minimizes costs within a range of operating constraints. The costing and engineering depth of the Parametric Costing Model is minimal at the present "entry level", and is intended only to demonstrate a potential for a more-detailed, cost-based integrating design tool. After describing the present basis of the Parametric Costing Model and giving an example of a single parametric scaling run derived therefrom, the impacts of choices related to resistive versus superconducting accelerator structures and cost of electricity versus plant availability ("load curve") are reported. Areas of further development and application are suggested.

16354 (LBL–36500) **Annual meeting of the Advanced Light Source Users' Association.** Lawrence Berkeley Lab., CA (United States). Feb 1995. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9410246–: 7. annual meeting of the Advanced Light Source Users Association, Berkeley, CA (United States), 20-21 Oct 1994). Order Number DE95009373. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains papers on the following topics: ALS Director's Report; ALS Operations Update; Recent Results in Machine Physics; Progress in Beamline Commissioning and Overview of New Projects; The ALS Scientific Program; First Results from the SpectroMicroscopy Beamline; Soft X-ray Fluorescence Spectroscopy of Solids; Soft X-Ray Fluorescence Spectroscopy of Molecules; Microstructures and Micromachining at the ALS; High-Resolution Photoemission from Simple Atoms and Molecules; X-Ray Diffraction at the ALS; Utilizing Synchrotron Radiation in Advanced Materials Industries; Polymer Microscopy: About Balls, Rocks and Other "Stuff"; Infrared Research and Applications; and ALS User Program.

4302 Beam Dynamics, Field Calculations, and Ion Optics

Refer also to citation(s) 17356

16355 (BNL–61552) **The linear parameters and the decoupling matrix for linearly coupled motion in 6 dimensional phase space. Informal report.** Parzen, G. Brookhaven National Lab., Upton, NY (United States). Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (AD/RHIC–132). Order Number DE95009042. Source: OSTI; NTIS; INIS; GPO Dep.

It will be shown that starting from a coordinate system where the 6 phase space coordinates are linearly coupled, one can go to a new coordinate system, where the motion is uncoupled, by means of a linear transformation. The original coupled coordinates and the new uncoupled coordinates are related by a 6 x 6 matrix, R. R will be called the decoupling matrix. It will be shown that of the 36 elements of the 6 x 6 decoupling matrix R, only 12 elements are independent. This may be contrasted with the results for motion in 4-dimensional phase space, where R has 4 independent elements. A set of equations is given from which the 12 elements of R can be computed from the one period transfer matrix. This set of equations also allows the linear parameters, β_i, α_i = 1, 3, for the uncoupled coordinates, to be computed from the one period transfer matrix. An alternative procedure for computing the linear parameters, the β_i, α_i i = 1, 3, and the 12 independent elements of the decoupling matrix R is also given which depends on computing the eigenvectors of the one period transfer matrix. These results can be used in a tracking program, where the one period transfer matrix can be computed by multiplying the transfer matrices of all the elements in a period, to compute the linear parameters α_i and β_i, i = 1, 3, and the elements of the decoupling matrix R. The procedure presented here for studying coupled motion in 6-dimensional phase space can also be applied to coupled motion in 4-dimensional phase space, where it may be a useful alternative procedure to the procedure presented by Edwards and Teng. In particular, it gives a simpler programming procedure for computing the beta functions and the emittances for coupled motion in 4-dimensional phase space.

16356 (JINR–9-92-231) **Electron beams from the phasotron in a low-background laboratory.** Dem'yanov, A.V.; Drebushko, A.E.; Mamedov, T.N.; Roganov, V.S.; Tsupko-Sitnikov, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 15p. (In Russian). Order Number DE95626778. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes electron (positron) beams obtained in a low-background laboratory by means of beamline 2 from the JINR phasotron. The beams were shaped in the momentum range from 30 to 350 MeV/c with the spread of +-5% and intensity 10^5-10^6 particles per second per 1 μA of the extracted proton beam. The information an admixtures of other particles depending on the momentum are given. 7 refs.; 9 figs.; 1 tab.

16357 (JINR-E–11-90-204, pp. 63) **Calculation of beam dynamics in magnetic field with phase symmetry using the method of immersion in the moment phase space.** Ivanov, E.L.; Kostova, Z.T.; Perelsstein, E.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEAM DYNAMICS/computer calculations; BEAM DYNAMICS/magnetic fields; JINR CYCLOTRONS; R CODES

16358 (JINR-E–11-90-204, pp. 65) **Investigation of a system of equations to calculate the charged particle beam emittance.** Lapteva, L.P.; Malyovanny, I.V.; Samojlov, A.V.; Volkov, B.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in*

Physical Research. Collection of abstracts. 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE BEAMS/beam emittance; PARTICLE BEAMS/matrices; COMPUTER CALCULATIONS; MATRICES

16359 (JINR-E–11-90-204, pp. 65-66) **Investigation of betatron oscillations in the vicinity of nonlinear resonance in cyclic accelerators using analytical computer calculations.** Lapteva, L.P.; Malyovanny, I.V.; Samojlov, A.V.; Volkov, B.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CYCLIC ACCELERATORS/betatron oscillations; ANALYTICAL SOLUTION; NONLINEAR PROBLEMS; R CODES; STABILITY

16360 (JINR-E–11-90-204, pp. 66) **Algebraic numerical calculation of symplectic maps for particle tracking inside accelerators.** Andrianov, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CYCLIC ACCELERATORS/charged particles; CYCLIC ACCELERATORS/trajectories; ACCURACY; ALGEBRA; CORRECTIONS; TRAJECTORIES; NUMERICAL SOLUTION; R CODES

16361 (JINR-E–11-90-204, pp. 87-88) **Application of computer algebra for solving some magnet-optical problems.** Malyovanny, I.V.; Samojlov, A.V.; Volkov, B.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE BEAMS/beam transport; PARTICLE BEAMS/focusing; ALGEBRA; COMPUTER CALCULATIONS; ELECTROMAGNETS; FOCUSING

16362 (JINR-R–2-92-285) **Electronuclear breeding in thorium targets.** Barashenkov, V.S.; Sosnin, A.N.; Shmakov, S.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 15p. (In Russian). Order Number DE95626777. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to At Energ.

Interaction of 1 GeV proton beam with the various Thorium targets is simulated by the Monte Carlo method. It is shown that un the big (practilally infinite) metal thorium slab the neutron yield is one third less than is similar ^{238}U slab. The influence of lead core introduced for the more efficient heat transfer is invesigated. The dependence of the breeding characteristics on the homogeneous enrichment of thorium target by ^{233}U isotope is considered. The neutron multiplication and the heat yield are calculated in the system with sodium coolant similar to the blanket zone of the fast neutron reactor. The influence of homogeneous enrichment of Thorium by ^{233}U isotope is discussed. 6 refs.; 15 figs.; 2 tabs.

16363 (JINR-R–9-94-473) **Peculiarities of the Particles Longitudinal Motion in the Phasotron with Presence of the Ionization Losses.** Borisov, O.N.; Onishchenko, L.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 10p. (In Russian). Order Number DE95627937. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Particle Accelerators.

The influence of the ionization losses in the diagnostic foil on the longitudinal motion of charge particles at the JINR Phasotron is considered. The main effects, which are obtained analytically and confirmed by numerical calculations, consist in the synchronous phase shift and the phase oscillations amplitude compression. 8 refs., 11 figs.

16364 (SLAC/AP–100) **Notes on lie algebraic analysis of achromats.** Wang, Chunxi; Chao, A. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jan 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE95009524. Source: OSTI; NTIS; INIS; GPO Dep.

Normal form technique is a powerful method to analyze the achromat problem. Assume the one cell map $M_{cell} = AR e^{:h_3:} e^{:h_4:} A^{-1}$, where h_3,h_4 are the normal forms of the generators of the unit cell map, and A is the nonlinear transformation that brings M_{cell} into its normal form; then the map of the whole system is $M_N = M_{cell}^N = AR^N A^{-1} = I$, provided that we can set $e^{:h_3:}$, $e^{:h_4:}$, and R^N to the identity (or only δ dependent) maps. Therefore, the conditions to form an achromat are h_3 and h_4 equal to zero (or δ dependent only) and the total linear map is identity. In this report, we will apply these conditions to a FODO array (a simple model system) to make it an achromat. We will start from Hamiltonians and work all the way up to obtain the analytical expressions of the required sextupole and octupole strengths.

4303 Auxiliaries and Components

Refer also to citation(s) 15005, 16208, 16209, 16213, 16216, 16219, 16230, 16232, 16233, 16340, 16399, 16427, 16758, 16780, 16997, 17088, 17361

16365 (BNL–61149, pp. 4) **A new versatile target design.** Zetterberg, U.; Koziorowski, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The target presents a potential hazard with regard to radiation exposure to personnel during service and maintenance of the cyclotron. To minimize the radiation hazard associated with target handling, the objective was to design a simple, reliable, long-time-between-maintenance, and easily serviced target. This led to a modular concept where the targets consist of a limited number of standardized building blocks. No target is unique in its composition/structure. The targets are designed for manufacturing and assembly simplicity for instance by using an extruded aluminum hollow profile thereby providing a target unit with high reliability and reproducibility. The time for removing/attaching the target from/to the cyclotron is about 0.5 minutes. The time for assembling/disassembling is about 5 minutes. The short handling times reduces the personal dose appreciably.

16366 (BNL–61149, pp. 5-11) **Pushing beam currents to the limit.** Stevenson, N.R. (TRIUMF, British Columbia (Canada)); Nortier, F.M.; Gelbart, W.Z.; Bloemhard, R.; Elzen, R. van den; Hunt, C.; Lofvendahl, J.; Orzechowski, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

One of the cyclotron systems running at the Nordion Int. radioisotope production facility at TRIUMF is the EBCO TR30. This cyclotron produces up to 250 μA on each of two beamlines simultaneously. Two solid (for the production of ^{201}Tl, ^{57}Co, ^{67}Ga and ^{111}In) and a gaseous (for producing ^{123}I) target station are in routine operation on this facility. Since future projections indicate a greater demand for reliable radioisotope production there is a program underway to increase the output of the facility to double the present level. One way that this is being achieved is through a careful thermal analysis of the solid target system to maximize its performance. In conjunction with this, the authors have developed and tested a 500 μA upgrade of the solid target system. Gas targets are being investigated for possible ways of increasing the efficiency of production via rotating/sweeping beams which allow

higher beam currents. Finally, the TR30 cyclotron is being upgraded to deliver 50-100% more beam on target. By pushing both the cyclotron and target technology to the limit will produce significantly higher levels of radioisotopes than many other comparable facilities.

16367 (BNL–61149, pp. 130-133) **Overcoming cyclotron energy constraints through targetry.** Finn, R. (Memorial Sloan-Kettering Cancer Center, New York, NY (United States)); Sheh, Y.; Vecchione, J.; Schlyer, D.; Firouzbakht, M. Brookhaven National Lab., Upton, NY (United States). 1994. DOE Contract FG02-86ER60407. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The past decade has witnessed a rapid growth in the number of PET-Cyclotron Facilities, each with specific clinical or research programs. This diversity of research interests has been partially responsible for the evaluation of the potential clinical utility of several radionuclides which had been previously dismissed from further consideration due to the lack of pure positron emitter decay characteristics. The particular nuclear reaction utilized to produce such radionuclides is not always amenable to the classical gas or liquid target. Such is the case in this research effort which requires a solid target irradiation station compatible with a retrofitted Japan Steel Works target changer to The Cyclotron Corporation CS-15 cyclotron. The authors have fabricated such a target from readily available components. The operational characteristics and unique features of the target system are outlined.

16368 (BNL–61149, pp. 219-225) **A target chamber for the routine production of [^{18}F]-F_2.** Dahl, J.R. (Cornell Univ. Medical College, Manhasset, NY (United States)); Belakhlef, A.; Matacchieri, R.A.; Chaly, T.C.; Margouleff, D.; Koziorowski, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

[^{18}F]-F_2 continues to provide a convenient route for the preparation of ^{18}F labeled compounds. Due to the smaller cross sectional area of the beam profile which may result when the target is mounted at the end of a beam transport line, a target chamber optimized for use with a cyclotron equipped with a beam transport system may not be optimal for use on a cyclotron with the targets mounted directly on the beam exit port, even though the machines may be otherwise similar. This situation poses the problem: design a target chamber with sufficient reliability and yield to allow pursuit of a clinical research program dependent upon [^{18}F]-F_2 as a radiolabeling precursor and which works well when mounted directly on the beam exit port of a positive ion cyclotron or when mounted at the end of a beam transport line. Such a target will be suitable for use with either a circular beam entrance window for use on a beam line, or with a beam entrance window for the horizontally elongated beam obtained at the beam exit port.

16369 (BNL–61149, pp. 323-329) **Control of radioactive material pneumatic transport system using an inexpensive programmable logic controller.** Dembowski, B. (Hospital of Univ. of Pennsylvania, Philadelphia, PA (United States)); Gonzalez-Lepera, C. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The Flexo-Rabbit Pneumatic Transport System provided by Intertech Nuclear Products Division was installed at the University of Pennsylvania Cyclotron Facility in 1987-88 connecting the Cyclotron Facility to the PET center with 390 m of tubing. The original transport system had two receiving stations, one for the PET center in the University Hospital and one in a Radiochemistry Research Lab located in a Medical Research Building. A diverter station located in line controlled the destination of the transport capsule. With the removal of the research lab station and diverter, modification of the control system was necessary. Space restrictions around the Cyclotron Radiochemistry Lab also demanded a better solution to the Personal Computer/interface box control system, without jeopardizing the systems safety interlocks. The authors selected a Programmable Logic Controller (PLC) and a small control box to replace the original equipment. In addition, a new loading station in an effort to reduce radiation exposure during operation was introduced.

16370 (BNL–61149, pp. 330-332) **Remote/local control circuit for accelerator targets.** Belakhlef, A. (Cornell Univ. Medical College, Manhasset, NY (United States)); Dahl, J.R. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Operating experimental accelerator targets for radioisotope production requires a system which permits manipulation of the apparatus from a position adjacent to the targets during setup, and from the accelerator operating console during irradiation. Targets for producing different radioisotopes are mounted vertically on a target exchanger with vertical motion. These targets produce short-lived radioisotopes that are the basis for synthesizing the tracers used in positron emission tomography. Targets for radioisotope production are filled to specific volume and pressures from as many as five different tank gases, imposing the need for a reliable control of valves with continuous visual monitoring of the valve state. Appropriate signals to indicate the status of the controlled apparatus must be presented visually at both locations. The transient nature of experimental setups requires a highly adaptable control system. Apparatus setup suitable for the system herein described are readily adaptable to microprocessor control, once the operational procedure is developed using this system.

16371 (BNL–61149, pp. 353-356) **Status of the cyclotron/P.E.T. facility at the State University of New York at Buffalo.** Toorongian, S.A.; Haka, M.S. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A new P.E.T./Cyclotron facility has been constructed on the Main St. campus of the State University of New York at Buffalo to service the needs of Nuclear Medicine departments in Buffalo and throughout the Western New York area. This facility is jointly funded and operated by S.U.N.Y. and the Veterans Administration. The cyclotron, as well as the research labs and a nuclear pharmacy to prepare non-positron emitting radiopharmaceuticals, are located in a newly constructed facility on campus. The P.E.T. scanner is located in the Veterans Administration Hospital adjacent to the campus. The two annexes are connected by a pneumatic transport "rabbit" system. The cyclotron and all radiopharmaceutical synthesis apparatus have been purchased from Ion Beam Applications s.a. of Lovain-la-Neuve Belgium.

16372 (BNL–61149, pp. 357-358) **FDG production and quality control at North Carolina Baptist Hospital Bowman Gray School of Medicine P.E.T. Center.** Ehrenkaufer, R.E. (P.E.T. Center, Winston-Salem, NC (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The PET Center at North Carolina Baptist Hospital-Bowman Gray School of Medicine has been in operation since January of 1992. The radioisotope, radiopharmaceutical production hardware are comprised of Siemens/CTI RDS 112, 11 MeV, negative ion (H^-) cyclotron and associated radioisotope and radiopharmaceutical production equipment.

16373 (BNL–61581) **Monte Carlo simulations of muon production.** Palmer, R.B. (Brookhaven National Lab., Upton, NY

(United States)); Gallardo, J.C.; Fernow, R.C.; Torun, Y.; Neuffer, D.; Winn, D. Brookhaven National Lab., Upton, NY (United States). Mar 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9411210–3: 2. workshop on physics potential and development of mu+ mu- colliders, Sausalito, CA (United States), 17-19 Nov 1994). Order Number DE95009554. Source: OSTI; NTIS; INIS; GPO Dep.

Muon production requirements for a muon collider are presented. Production of muons from pion decay is studied. Lithium lenses and solenoids are considered for focusing pions from a target, and for matching the pions into a decay channel. Pion decay channels of alternating quadrupoles and long solenoids are compared. Monte Carlo simulations are presented for production of $\pi \rightarrow \mu$ by protons over a wide energy range, and criteria for choosing the best proton energy are discussed.

16374 (FNAL/C–95/039) **Operations aspects of the Fermilab Central Helium Liquefier Facility.** Geynisman, M.G.; Makara, J.N. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-950350–1: 10. intersociety cryogenic symposium, Houston, TX (United States), 19-23 Mar 1995). Order Number DE95009109. Source: OSTI; NTIS; INIS; GPO Dep.

The Fermilab Central Helium Liquefier (CHL) facility consists of helium and nitrogen reliquefier plants operated 24 hours-a-day to supply LHe at 4.6°K and LN_2 for the Fermilab Tevatron superconducting proton-antiproton collider ring and to recover warm return gases. Operating aspects of CHL, including different equipment and systems reliability, availability, maintenance experience, safety concerns, and economics aspects are discussed.

16375 (FNAL-TM–1926) **Calculated secondary yields for proton broadband using DECAY TURTLE.** Sondgeroth, A. Fermi National Accelerator Lab., Batavia, IL (United States). Feb 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95008955. Source: OSTI; NTIS; INIS; GPO Dep.

The calculations for the yields were done by Al Sondgeroth and Anthony Malensek. The authors used the DECAY deck called PBSEC_E.DAT from the CMS DECKS library. After obtaining the run modes and calibration modes from the liaison physicist, they made individual decay runs, using DECAY TURTLE from the CMS libraries and a production spectrum subroutine which was modified by Anthony, for each particle and decay mode for all particle types coming out of the target box. Results were weighted according to branching ratios for particles with more than one decay mode. The production spectra were produced assuming beryllium as the target. The optional deuterium target available to broadband will produce slightly higher yields. It should be noted that they did not include pion yields from klong decays because they could not simulate three body decays. Pions from klongs would add a very small fraction to the total yield.

16376 (FNAL-TM–1927) **Calculated dose rates in halls using CASIM.** Sondgeroth, A. Fermi National Accelerator Lab., Batavia, IL (United States). Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95008954. Source: OSTI; NTIS; INIS; GPO Dep.

The first part of this document shows the results of a series of CASIM runs designed to optimize the size of a steel cylinder so as to produce the highest density of stars at any given radius perpendicular to beam direction. For the next set of runs the length of the cylinder is now fixed at three meters and the authors vary the radius. These runs show that a cylinder with a radius of seven centimeters produces the highest dose rate. For the rest of the CASIM runs a cylinder three meters long with a radius of seven centimeters will be used. Using the optimized cylinder they now make runs using geometries more closely representing real experimental hall geometries in an attempt to predict possibly dose rates.

16377 (FNAL-TM–1929) **Reducing process noise in superconducting helium liquid level probes.** Brubaker, J. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95008956. Source: OSTI; NTIS; INIS; GPO Dep.

This memo presents methods to reduce the process noise accompanying the use of superconducting helium liquid level probes in a splashing environment. The development of these methods followed unsatisfactory operation of unmodified, commercially available, level probes used in each of the 24 valve box dewars of Tevatron refrigerators. The dewars function both as reservoirs of refrigeration and as phase separators at the inlet of the cold compressors used in subatmospheric magnet cooling operation.

16378 (IFVE-OKU–93-132) **On possibility of the GAMS-4π operation at positive coordinates of internal targets in block 27 of IHEP accelerator.** Aseev, A.A.; Gorin, M.Yu.; Zelenov, B.A.; Kardash, A.A.; Medvedev, V.A. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 11p. (In Russian). Order Number DE95628723. Source: OSTI; NTIS (US Sales Only); INIS.

The impossibility to realize a simultaneous proton extraction to FODS-2 and SWD of beam line 22 hindered the operation of GAMS-4π facility with π^--meson beam at the intensity of 2×10^7 p/c, which is achievable with an internal target in block 27 at positive coordinates. It was determined by technical capabilities of the slow extraction equipment. A possibility of an additional effect on the extracted proton beam was found during investigations, that allowed one to spill onto the last septum-magnet of the extraction system. 10 refs., 6 figs.

16379 (INIS-JP–029, pp. 63-65) **Development of stripper films made of high strength, long life carbon nitride.** Oyaizu, Mitsuhiro (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study); Sugai, Isamu; Yoshida, Koji; Haruyama, Yoichi. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

The heavy ion accelerators such as tandem type van de Graaff, linear accelerators, cyclotrons and so on raise the acceleration efficiency usually by producing multivalent ions by making the charge conversion of heavy ions using carbon thin films. However, when the electrons of large atomic number ions of low energy, high intensity current are stripped, the conventional carbon thin films on the market or home made were very short in their life, and have become the cause of remarkably lowering the acceleration efficiency. The concrete objectives of the development are the use of the charge conversion of unstable nuclear ions in the E arena accelerator for JHP of the future project of Institute of Nuclear Study and the manufacture of the carbon films which are used for the charge conversion of the H beam of high energy, but at the time of exchanging the films, there is the problem of the radiation exposure of large amount, therefore, the development of high reliability, long life stripper films has been strongly demanded. The experiment was carried out by controlled carbon arc discharge process using both AC and DC and the ion beam sputtering process using reactive nitrogen gas. The results are reported. (K.I.).

16380 (INP–1676/AP) **The problems of high efficient extraction from the isochronous cyclotron.** Schwabe, J. (Institute of Nuclear Physics, Cracow (Poland)). Institute of Nuclear Physics, Cracow (Poland). Jun 1994. 20p. Order Number DE95628724. Source: OSTI; NTIS; INIS.

The problem of high efficient extraction ($\eta \geq 50\%$) from isochronous cyclotrons (with the exception of the stripping method) is not completely solved up to this day. This problem is specifically important, because these cyclotrons are being also applied in the production of medical radioisotopes, labeled pharmaceuticals as well as in neutron therapy (oncology), machine industry, agriculture (plant mutagenesis), etc. The aim of the proposed topic is to solve this problem on the AIC-144 isochronous cyclotron in the INP (Institute of Nuclear Physics). Lately, a beam of 20 MeV deuterons with an efficiency of ca. 15% was extracted from this cyclotron. (author). 25 refs, 14 figs.

16381 (IYaF–93-110) **Injection and laser acceleration of ions based on the resonant surface photoionization.** Antsiferov, V.V.; Smirnov, G.I.; Telegin, G.G. AN SSSR, Novosibirsk (Russian

Federation). Inst. Yadernoj Fiziki. 1993. 11p. (In Russian). Order Number DE95628726. Source: OSTI; NTIS (US Sales Only); INIS.

The collective effects have been investigated of the injection and acceleration of the ion beams due to the resonant surface photoionization. The considered scheme of the laser accelerator allows to obtain positive ions with relativistic velocities. 11 refs., 2 figs.

16382 (JINR–9-92-225) **A transport line for beams of separated muons from the JINR phasotron to a low-background laboratory.** Andreev, E.M.; Dem'yanov, A.V.; Mamedov, T.N.; Roganov, V.S.; Tsupko-Sitnikov, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 15p. (In Russian). Order Number DE95626797. Source: OSTI; NTIS (US Sales Only); INIS.

Meson channel 2 of the JINR phasotron for transportation of separated muon beams to the low-background laboratory is described. Changes in the design of the magnetic analyser of the beamline 2 not only increased the intensity by a factor of more than 2 but also improved the spatial distribution of the beam at its exit. For negative muons of momentum 125 MeV/c the intensity is $6x10^4$ part./s (per 1 μA of the extracted proton beam) with a 9% admixtire of electrons and 0.4% of pions, the momentum resolution of the channel is +-6 MeV/c. The intensity of the 125 MeV/c posiive muon beam is $2x10^5$ part./s per 1μA of the proton beam, the positron admixture is 3%. 9 refs.; 7 figs.; 1 tab.

16383 (JINR-E–3-94-128, pp. 16-17) **The high-luminosity lead slow-down neutron spectrometer driven by the proton linac of the Moscow meson factory.** Alekseev, A.A. (and others); Bergman, A.A.; Volkov, A.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SPECTROMETERS/meson factories; EV RANGE 10-100; KEV RANGE 01-10; KEV RANGE 10-100; LEAD; LINEAR ACCELERATORS; LUMINOSITY; PROTON BEAMS; SLOWING-DOWN

16384 (JINR-E–3-94-128, pp. 21) **Plutonium booster IREN: status of the project, design topics.** Lomidze, V.L.; Popov, Yu.P.; Rogov, A.D.; Rudenko, V.T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/particle boosters; FAST NEUTRONS; FEASIBILITY STUDIES; LINEAR ACCELERATORS; PLUTONIUM; POWER RANGE 01-10 KW; PULSED NEUTRON TECHNIQUES

16385 (JINR-E–9-94-369) **Charge Exchange Injection of Heavy Ions in Synchrotrons.** Angelov, V. (Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika); Dinev, D.; Tsenov, S.; Dmitriev, I.; Mikhajlov, V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 34p. Order Number DE95626789. Source: OSTI; NTIS (US Sales Only); INIS.

The problems of the charge exchange injection of heavy ions into synchrotrons are discussed. The local orbit bump stimulated by three or four magnets is described for the case of general element arrangement. Formulas for the emittance growth due to the multiple scattering in the stripper and to the ionization losses (with non-zero dispersion) are deduced. The additional parameters are calculated. Two modes of ion storage are considered with fixed and moving orbit bumps. A procedure for calculating of the second mode is given. All these relations are applied to the NUCLOTRON booster, being now under design at the Laboratory of High Energies. 33 refs., 10 figs.; 7 tabs.

16386 (JINR-E–9-94-398) **Calculation of Gas Mixing Effect in ECR Ion Source.** Zhao Hongwei (Academia Sinica, Lanzhou, GS (China). Inst. of Modern Physics); Efremov, A.A.; Kutner, V.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 20p. Order Number DE95626786. Source: OSTI; NTIS (US Sales Only); INIS.

Presented to the 7-th International Conference on the Physics of Highly Charged Ions, Sep 1994, Vienna, Austria.

The gas mixing effect in electron cyclotron resonance (ECR) multicharged ion source consists in a substantial increase to the current of high charge state ions. In order to understand mechanism of the gas mixing effect, the effects of support gas (O_2) on the ion (Ar) charge state distribution, the plasma potential, the potential dip, the average charge state, the electron scattering rate, and the thermal electron density are studied numerically on the basis of a simple balance model. The dependence of the ion charge state distribution on the ion temperature, the hot electron temperature and the hot electron density are also calculated. The calculated charge state distributions are fitted with the experimental data of two different ECR ion sources. Finally, we point out that it might be the combination of the several factors that results in the gas mixing effect. 18 refs., 17 figs.

16387 (SAND–95-0686C) **Cryogenic thermometry in superconducting accelerators.** Datskov, V.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Cryogenics Dept.); Demko, J.A.; Hentges, M.; Weisend, J.G. Sandia National Labs., Albuquerque, NM (United States). 4 Apr 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950512–1: Particle accelerator conference, Dallas, TX (United States), 1-5 May 1995). Order Number DE95009864. Source: OSTI; NTIS; INIS; GPO Dep.

The cryogenic thermometers used in superconducting accelerators must function in very adverse environments. Typical conditions are a temperature range of 1.5–300 K, high irradiation doses and magnetic fields which must be endured for the 20 to 50 year life of the accelerator. The authors determined the principal requirements for cryogenic thermometers in accelerator installations and for industrial applications. Some constructions of the thermometer mounting fixtures used in the "Nuclotron" (Dubna, Russia) and the SSCL (Dallas, USA) accelerator installations are described. The experimental results for long-term stability of the cryogenic thermometers applied are presented. The basic recommendations on the application technology of the cryogenic thermometers in large superconducting accelerator systems are given.

16388 (SLAC-PUB–95-6755) **RF pulse compression for future linear colliders.** Wilson, P.B. Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9410218–9: Pulsed radio frequency sources for linear colliders, Long Island, NY (United States), 2-7 Oct 1994). Order Number DE95010330. Source: OSTI; NTIS; INIS; GPO Dep.

Future (nonsuperconducting) linear colliders will require very high values of peak rf power per meter of accelerating structure. The role of rf pulse compression in producing this power is examined within the context of overall rf system design for three future colliders at energies of 1.0–1.5 TeV, 5 TeV and 25 TeV. In order keep the average AC input power and the length of the accelerator within reasonable limits, a collider in the 1.0–1.5 TeV energy range will probably be built at an x-band rf frequency, and will require a peak power on the order of 150–200 MW per meter of accelerating structure. A 5 TeV collider at 34 GHz with a reasonable length (35 km) and AC input power (225 MW) would require about 550 MW per meter of structure. Two-beam accelerators can achieve peak powers of this order by applying dc pulse compression techniques (induction linac modules) to produce the drive beam. Klystron-driven colliders achieve high peak power by a combination of dc pulse compression (modulators) and rf pulse compression, with about the same overall rf system efficiency (30–40%) as a two-beam collider. A high gain (6.8) three-stage binary pulse compression system with high efficiency (80%) is described, which (compared to a SLED-11 system) can be used to reduce the klystron peak power by about a factor of two, or alternately, to cut the number of klystrons in half for a 1.0–1.5 TeV x-band collider. For a 5 TeV klystron-driven collider, a high gain, high efficiency rf pulse compression system is essential.

4304 Storage Rings

16389 (ENEA-RT-INN–94-47) **Storage-ring fel longitudinal dynamics.** Dattoli, G. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Giannessi, L.; Renieri, A. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. May 1994. 24p. (RT/INN–94-47). Order Number DE95771026. Source: OSTI; NTIS (US Sales Only).

The modifications induced on the longitudinal dynamical behaviour of an e-beam circulating in a Storage-Ring (S.R.) and undergoing a FEL (Fokker-Planck equation) interaction are studied. The low gain amplifier case and, using the Fokker-Planck equation, is discussed and it is evaluated the effect of the FEL interaction on the longitudinal damping time, which is shown to be a funcion of the detuning parameter and the intensity itself. A self-consistent model of the S.R. FEL dynamics capable of including saturation, induced energy spread and damping time modifications is developed. The model is shown to be particularly useful to investigate the system evolution and the interplay between the various features causing the saturation of the device.

16390 (JINR-E–3-94-128, pp. 16) **The european spallation neutron source project ESS.** Conrad, H.; Lengeler, H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/feasibility studies; NEUTRON SOURCES/proton beams; LINEAR ACCELERATORS; PULSED NEUTRON TECHNIQUES; SPALLATION; STORAGE RINGS; SUPERCONDUCTING MAGNETS

16391 (JINR-E–3-94-128, pp. 19) **The pulsed neutron source for the Moscow meson factory. Second generation.** Grachev, M.I.; Kravchuk, L.V.; Stavissky, Yu.Ya. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/feasibility studies; NEUTRON SOURCES/meson factories; LINEAR ACCELERATORS; PULSED NEUTRON TECHNIQUES; STORAGE RINGS; TARGET CHAMBERS

44 INSTRUMENTATION

Refer also to citation(s) 16664, 16854

4401 Radiation Instrumentation

Refer also to citation(s) 15152, 15171, 15677, 15814, 16123, 16348, 16546, 16547, 16630, 16639, 16640, 16656, 16662, 16780, 16849, 16911, 17368

16392 (BARC–1994/E/038) **Automatic processing of gamma ray spectra employing classical and modified Fourier transform approach.** Rattan, S.S. (Bhabha Atomic Research Centre, Bombay (India). Radiochemistry Division); Madan, V.K. Bhabha Atomic Research Centre, Bombay (India). 1994. 21p. Order Number DE95628031. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes methods for automatic processing of gamma ray spectra acquired with HPGe detectors. The processing incorporated both classical and signal processing approach. The classical method was used for smoothing, detecting significant peaks, finding peak envelope limits and a proposed method of finding peak limits, peak significance index, full width at half maximum, detecting doublets for further analysis. To facilitate application of signal processing to nuclear spectra, Madan et al. gave a new classification of signals and identified nuclear spectra as Type II signals, mathematically formalized modified Fourier transform and pioneered its application to process doublet envelopes acquired with modern spectrometers. It was extended to facilitate routine analysis of the spectra. A facility for energy and efficiency calibration was also included. The results obtained by analyzing observed gamma-ray spectra using the above approach compared favourably with those obtained with SAMPO and also those derived from table of radioisotopes. (author). 15 refs., 3 figs., 3 tabs.

16393 (CERN–94-07) **International workshop on advanced materials for high precision detectors. Proceedings.** Nicquevert, B. (ed.); Hauviller, C. (ed.). European Organization for Nuclear Research, Geneva (Switzerland). 25 Oct 1994. 211p. (CONF-9409327–: International workshop on advanced materials for high precision detectors, Archamps Haute Savoie (France), 28-30 Sep 1994). Order Number DE95626965. Source: OSTI; NTIS (US Sales Only); INIS.

These proceedings gather together the contributions to the Workshop on Advanced Materials for High Precision Detectors, which was held from 28-30 September 1994 in Archamps, Haute-Savoie, France. This meeting brought together international experts (researchers, physicists and engineers) in the field of advanced materials and their use in high energy physics detectors or spacecraft applications. Its purpose was to discuss the status of the different materials currently in use in the structures of detectors and spacecraft, together with their actual performances, technological implications and future prospects. Environmental effects, such as those of moisture and radiation, were discussed, as were design and manufacturing technologies. Some case studies were presented. (orig.).

16394 (CONF-9304128–, pp. B.26-B.34) **Los Alamos Mobile Radiological Laboratory fielded during post shot drilling operations at the Nevada Test Site.** Carpenter, J. (Los Alamos National Lab., NM (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory Health Physics group fields a 10 x 50 semi trailer housing radiation detection systems during each post shot drilling operation. A discussion of the post shot drilling equipment, procedures, and radiological concerns are included together with a description of the radiation detection systems installed in the trailer. Each detection system is integrated with the drilling and "containment" features to provide continuous radiological monitoring of a Continuous Air Monitoring (CAM) on the rig floor, radiological gases in the cellar and annulus of the blow out preventer (BOP), estimate of activity released through a breach of the containment system, and direct radiological monitoring of the fluid returns during the drilling process. The containment features of the drilling operation and the detection systems in the trailer are calibrated annually as an integrated system by releasing Xenon-133 gas in the cellar and tracking it through the system.

16395 (CONF-9408213–1) **First results with the Microball and Gammasphere.** Sarantites, D.G. (Washington Univ., St. Louis, MO (United States). Dept. of Chemistry); Hua, P.F.; LaFosse, D. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on physics from large gamma-ray detector arrays; Berkeley, CA (United States); 2-6 Aug 1994. Order Number DE95009614. Source: OSTI; NTIS; INIS; GPO Dep.

The Microball, an improved 4π multi-detector array, was used recently in conjunction with Gammasphere in three experiments. Highlights of the first results are presented here. The Microball consists of 95 CsI(T*l*) scintillation detectors with individual Si photodiode readout, arranged in 9 rings. In these first experiments the Microball performed as designed, but the results in new physics exceeded the authors' expectations. They can say with certainty that by its powerful channel selection the Microball enhanced the performance of Gammasphere by one full coincidence fold. This was possible for all exit channels involving charged particle emission, with increasing performance benefit as one progressed to

lighter reaction systems. They summarize the essential characteristics of the Microball and give some performance benchmarks. A detailed description of the Microball is given.

16396 (DESY–95-005) **Simulation of the ZEUS calorimeter.** Iga, Y. ZEUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jan 1995. 20p. Order Number DE95770018. Source: OSTI; NTIS (US Sales Only); INIS.

The simulation of the ZEUS uranium-scintillator calorimeter is presented. It is based on the GEANT and GHEISHA Monte Carlo packages. To simulate the high resolution calorimater with adequate precision and feasible execution time, two fast, tunable shower terminators have been developed. One of them (electromagnetic shower terminators) is applied for electromagnetic particles and the other (neutron shower terminators) for hadronic interactions inside the uranium calorimeter. The calorimeter simulation was tuned and verified with extensive data, obtained with prototype and production modules in test-meams at CERN and Fermilab. The simulation reproduces the energy resolution and e/h ratio for momenta down to 0.5 GeV/c. The simulated longitudinal and transverse shower profiles also agree reasonably well with data. Effects caused by the boundary between read-out cells and by extra material in front of the calorimeter are also reproduced well by the simulation. The shower terminators reduce the execution time by a factor of about 15. (orig.)

16397 (DOE/ER/40445–46) **The design and construction of the muon arm in PHENIX. Progress report for the period December 15, 1993–December 1, 1994.** Kirk, P.N. Louisiana State Univ., Baton Rouge, LA (United States). Intermediate Energy Nuclear Physics Group. 15 Dec 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER40445. Order Number DE95010156. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to describe activities performed by the Intermediate Energy Nuclear Physics Group (IENPG) at the Louisiana State University (LSU). The report will cover the period of time between approximately December 15, 1993, and the present. The principal focus of the activities is the muon subgroup of the PHENIX Collaboration. During the preceding year the authors have contributed substantially to the development of hardware for the muon arm of PHENIX and have undertaken an important simulation that will be discussed in the accompanying renewal proposal. The authors are, however, in the process of concluding other activities, most notably their membership in the Di-Lepton Spectrometer (DLS) Collaboration at LBL. During the preceding year the authors have undertaken a major calculation on behalf of the DLS Collaboration. Because of its fundamental nature, its importance to the DLS Collaboration, and its applicability to any other spectrometer, they shall discuss this calculation in considerable detail, both in this progress report and the accompanying renewal proposal. In addition they are members of the E866 Collaboration at Fermilab and the AMY Collaboration at KEK.

16398 (FNAL/C–94/150-E) **Implementation of the shower max electron trigger at CDF.** Byrum, K. (Argonne National Lab., IL (United States)); Dawson, J.; Nodulman, L.; Wicklund, A.B.; Amidei, D.; Burkett, K.; Gerdes, D.; Miao, C.; Wolinski, D. Fermi National Accelerator Lab., Batavia, IL (United States). Jun 1994. 18p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Istituto Nazionale di Fisica Nucleare, Rome (Italy);Ministry of Education, Science and Culture (Japan);Natural Sciences and Engineering Research DOE Contract AC02-76CH03000. (CONF-940722–44: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95006684. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have built and installed new electronics which brings the central shower max detector into the CDF Level-2 trigger. By matching a stiff track from the central fast track processor to an associated shower max cluster, this trigger improvement reduces the electron Level-2 cross section by approximately 50% while retaining greater than 85% of real electrons and allows the authors to lower their electron trigger threshold.

16399 (FNAL/C–95/01-E) **Performance and calibration of the D0 uranium liquid-argon calorimeter.** Guida, J. (State Univ. of New York, Stony Brook, NY (United States)). D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-941060–5: 4. international conference on advanced technology and particle physics, Como (Italy), 3-7 Oct 1994). Order Number DE95007961. Source: OSTI; NTIS; INIS; GPO Dep.

The performance of the Dϕ uranium liquid-argon calorimeter is discussed, as well as the electromagnetic energy calibration. Results from test beam studies and collider data are incorporated to estimate the energy scale. The ϕ symmetry of the events is used to improve the understanding of the electromagnetic part of the calorimeter, and the EM energy scale is determined from $Z \rightarrow e^+e^-$ events. The calorimeter's response to other resonances is also investigated.

16400 (FNAL/C–95/037) **Backgrounds and detector performance at a 2 x 2 TeV $\mu^+\mu^-$ collider.** Foster, G.W.; Mokhov, N.V. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9411210–1: 2. workshop on physics potential and development of mu+ mu- colliders, Sausalito, CA (United States), 17-19 Nov 1994). Order Number DE95009107. Source: OSTI; NTIS; INIS; GPO Dep.

The rich physics potential of a high-energy high-luminosity $\mu^+\mu^-$ collider and the surprising feasibility of a design attract the attention of many people these days. A few issues define the practicality of such a project, with the enormous particle background levels in a detector due to unavoidable reasons holding first place. In contrast to hadron colliders where particle backgrounds come both from interaction point (IP) and accelerator, almost all the backgrounds in the muon collider detectors arise in the machine. The decay length for 2 TeV muons is $\lambda_D{}^{-1} \sim 10^{-7}$ m^{-1}. With 10^{12} muons in a bunch one has 10^5 decays per meter in a single pass through an interaction region, and 10^8 decays per meter per 12 msec store. This paper examines two major classes of detector backgrounds presented in the muon collider: beam halo backgrounds, and the "direct" backgrounds from electrons from $\mu \rightarrow e\nu\bar{\nu}$ decay occurring in the beam channel. The authors describe the nature of both of these backgrounds, provide results of first realistic calculations for both sources and discuss their effects on plausible detectors. Various shielding and collimation geometries have been simulated, and their efficacy and the nature of the surviving background discussed.

16401 (IFVE-OEA–93-114) **Some algorithms of the events recognition in the Tagged Neutrino Facility.** Mukhin, S.A. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 12p. (In Russian). Order Number DE95628785. Source: OSTI; NTIS (US Sales Only); INIS.

Some algorithms of the events recognition in Tagged Neutrino Facility are described: the event localization in Bars neutrino detector, the off-line trigger, the reconstruction of events vertex, events reconstruction in Tagging Station. The programming package for realization of clusterization methods that have been used for mentioned algorithms realization is presented. 6 refs., 2 tabs.

16402 (IFVE-OEIUNK–93-115) **Vertex microstrip detector. Design and performances.** Grebenev, V.N. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Loginov, A.I.; Maloletnev, A.A. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 8p. (In Russian). Order Number DE95628786. Source: OSTI; NTIS (US Sales Only); INIS.

The vertex detector consisting of eight silicon microstrip planes with high space resolution was designed for use on the set-up VES of IHEP. Test results are given for single detector plane using IHEP accelerator beam. 4 refs., 4 figs.

16403 (IFVE-ONF–93-122) **Characteristics of modular compound photon-hadron sampling-calorimeter.** Barkov, B.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki); Katinov, Yu.V.; Lisin, V.I.; Nozdrachev, V.N.; Semenov, V.K.; Slobobyuk, E.A. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 18p. (In Russian). Order Number DE95628787. Source: OSTI; NTIS (US Sales Only); INIS.

A prototype of a compound electromagnetic-hadron calorimeter, consisting of consecutive independent electromagnetic and hadron sampling-calorimeters, was tested in π^- beam at 40 GeV. The energy and mass resolution are obtained as the function of relative energy deposition in electromagnetic and hadron parts of the calorimeter. GEANT calculation of energy deposition is in a reasonable agreement with experimental data, but hadron beam calibration of the detector is essential for accurate measurement of shower energy and position. The compound detector has better energy and coordinate resolution and better ability to identify electromagnetic and hadron showers. 26 refs., 11 figs., 1 tab.

16404 (IFVE-ONF–93-128) **Versions of tubes combining for ionization 'spaghetti'-calorimeter.** Misyura, S.P.; Smol', A.V. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 29p. (In Russian). Order Number DE95628788. Source: OSTI; NTIS (US Sales Only); INIS.

The theoretical analysis of some electrical schemes of tubes combining intended for ionization 'spaghetti'-calorimeter is presented. The expediency of the parallel tubes connection is shown for all schemes being considered. The restrictions for the parameters of scheme elements (blocking capacitors, matching transformer etc.) have been deduced. 10 refs., 23 figs.

16405 (IHEP–93-129) **Radiation transparent mirrors for RICH (ring-imaging Cherenkov counters).** Braem, A. (European Organization for Nuclear Research (CERN), Geneva (Switzerland). Accelerator School); Kostrikov, M.E. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 8p. Order Number DE95628800. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility of obtaining beryllium substrates suitable for mirrors with average thickness of less than 1% of radiation length is demonstrated. 15 refs., 3 figs., 1 tab.

16406 (IHEP–93-153) **Separation of the overlapping electromagnetic showers in the cellular GAMS-type calorimeters.** Lednev, A.A. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 10p. Order Number DE95628789. Source: OSTI; NTIS (US Sales Only); INIS.

The structure of gamma reconstruction program for the GAMS spectrometer is described. Reconstruction efficiencies of two and three space-overlapping showers for detectors with different cell size are presented. 3 refs., 17 figs.

16407 (INEL–94/0003) **Test plan for glove box testing with the real-time transuranic dust monitor.** Partin, J.K.; Fincke, J.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008621. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the objectives, instrumentation, and testing procedures used to prove the feasibility of a real-time transuranic dust monitor (RTDM). The RTDM is under development at the Idaho National Engineering Laboratory (INEL) as a Waste Characterization Technology funded by the Buried Waste Integrated Demonstration Project. The instrument is an in situ monitor that uses optical techniques to establish particle size, particle number density, and mass and species of heavy metal contamination. US Department of Energy orders mandate the assessment of radiological exposure and contamination spread during the remediation of radioactive waste. Of particular concern is heavy metal contamination of dust, both radioactive and nonradioactive. Small particles of metal, particularly the radioactive species, tend to become electrically charged and consequently attach themselves to dust particles. This airborne activated dust is a primary means of contamination transport during remediation activities, and therefore, must be continuously monitored to protect personnel involved in the operations and to control the spread of contamination. If real-time monitoring is not available there is increased likelihood of generating unacceptably high levels of contamination and being forced to shut down costly retrieval operations to decontaminate. A series of experiments are described to determine the optimal experimental design, operational parameters, and levels of detection for the RTDM. Initial screening will be performed using monodisperse particle standards to set parameters and calibrate the instrument. Additional testing will be performed using INEL soil samples spiked with a surrogate, cerium oxide, to prove the design before transporting the apparatus to the Test Reactor Area for testing with plutonium-contaminated dusts.

16408 (INIS-BR–3491) **Electret ionization chamber: a new method for detection and dosimetry of thermal neutrons.** Ghilardi, A.J.P. Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica. 1988. 153p. (In Portuguese). Order Number DE95627022. Source: OSTI; NTIS (US Sales Only); INIS.

An electret ionization chamber with boron coated walls is presented as a new method for detecting thermal neutrons. The efficiency of electret ionization chambers with different wall materials for the external electrode was inferred from the results. Detection of slow neutrons with discrimination against the detection of γ-rays and energetic neutrons was shown to depend on the selection of these materials. The charge stability over a long period of time and the charge decay owing to natural radiation were also studied. Numerical analysis was developed by the use of a micro-computer PC-XT. Both the experimental and numerical results show that the sensitivity of the electret ionization chamber for detection of thermal neutrons is comparable with that of the BF_3 ionization chamber and that new technologies for deposition of the boron layer will produce higher efficiency detectors. (author). 102 refs, 32 fig, 10 tabs.

16409 (INIS-mf–14483, pp. 151) **Three-axis neutron diffractometer for study of residual stresses in polycrystalline materials.** Lukas, P. (Ceska Akademie Ved, Rez (Czech Republic). Ustav Jaderne Fyziky); Mikula, P.; Vrana, M.; Kulda, J. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DIFFRACTOMETERS; NEUTRON BEAMS; POLYCRYSTALS; RESIDUAL STRESSES

16410 (INIS-mf–14483, pp. 159) **Moessbauer spectrometer on PC-AT.** Zak, D. (Palackeho Univ., Olomouc (Czech Republic). Prirodovedecka Fakulta); Maslan, M.; Snasel, V.; Cholmeckij, A.; Evdomikov, V.; Misevic, O. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MOESSBAUER SPECTROMETERS/ personal computers; SPECIFICATIONS

16411 (INIS-mf–14520) **Design of a chamber Pixe analysis at Nuclear Centre of Algiers.** Benamar, M.A. (Centre de Developpement des Techniques Nucleaires, Algiers (Algeria)); Midouni, A. No corporate text available. Jan 1995. 13p. (In French). Order Number DE95628032. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper a chamber design for Pixe analysis at nuclear center of Algiers is described. This chamber provides as fast vacuum rise and several possibilities of irradiation.

16412 (INIS-mf–14529, pp. 37) **Contributions to fundamentals of particle counting applied to radioactivity measurements.** Winkler, G. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COUNTING TECHNIQUES/radioactivity; ANTICOINCIDENCE; RADIOACTIVITY; EFFICIENCY; EXPERIMENTAL DATA; EXTRAPOLATION; ICRU; PARTICLES; RADIATION DETECTORS

16413 (INIS-mf–14529, pp. 37-38) **An electrometer amplifier for ionization chamber measurements.** Friedmann, H. Vienna

Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTROMETERS/amplifiers; EARTHQUAKES; ELECTROMETERS; AMPLIFIERS; FORECASTING; GROUND WATER; IONIZATION CHAMBERS; NATURAL GAS; RADON 222

16414 (INIS-mf–14529, pp. 39-42) **Application of nuclear methods for paleoclimatological studies of loess formations at Stiefern, Lower Austria.** Leitner-Wild, E. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Hille, P.; Aref-Azar, H.; Verginis, S. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PALEOCLIMATOLOGY/gamma spectroscopy; PALEOCLIMATOLOGY/neutron activation analysis; AUSTRIA; CARBONATES; CLIMATIC CHANGE; GRAIN SIZE; MAGNETIC SUSCEPTIBILITY; MANGANESE; PALEOCLIMATOLOGY; POTASSIUM; SODIUM; SOILS; THORIUM; URANIUM

16415 (INS–1088) **High resolution and two-dimensional focal plane detector for intermediate energy heavy ions.** Tanaka, M.H.; Fuchi, Y.; Kubono, S.; Kawashima, H.; Takaku, S.; Ichihara, T. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jan 1995. 15p. Order Number DE95767951. Source: OSTI; NTIS; INIS.

A large-area, high-resolution two-dimensional position sensitive gas detector has been developed for intermediate energy heavy ions. The x position information is obtained by a multi-cathode read-out method and the y position by measuring the drift time of electrons. This detector has no left-right ambiguity and very little dead layer in the sensitive area, resulting in a detector system which is thin and homogeneous in the whole sensitive area. The overall position resolution of 0.20 mm and 0.4 mm (FWHM) were obtained for x and y directions, respectively. The position resolutions at lower gas pressure were also measured to find an optimum operating condition to reduce multiple scattering effect from the window foils and the detector gas. This detector has been shown to be very useful for high-resolution heavy ion experiments at intermediate energies. (author).

16416 (JINR-E–1-94-375) **Simulation of Silicon Detectors for the ALICE Experiment at LHC.** Batyunya, B.; Zinchenko, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 7p. Order Number DE95626966. Source: OSTI; NTIS (US Sales Only); INIS.

A program for simulation of silicon detectors of the ALICE experiment is described. Some results of simulation of the detector characteristics are presented to demonstrate the program performance. 11 refs., 5 figs., 1 tab.

16417 (JINR-E–1-94-436) **Effect of Nonuniformity on the Energy Resolution of E.M. Sampling Calorimeters.** Budagov, Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Chirikov-Zorin, I.; Glagolev, V.; Pantea, A.; Pantea, D.; Tokar, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 19p. Order Number DE95628037. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods.

The response of a sampling tile electromagnetic calorimeter was simulated for incident electrons in 10-500 GeV energy range. The influence of tile to tile nonuniformity on the a and b coefficients of the calorimeter energy resolution parametrisation formula was investigated in detail. An energy resolution deterioration due to nonuniformity was observed, but it was shown that the tower by tower calibration can reduce this undesirable effect to reasonable limits. An explicit a and b coefficients dependence on σ_{non}, the tile response nonuniformity standard deviation, was found. Our previous results on this dependence obtained by analytical methods using the electromagnetic shower mean profile universal parametrisation and the present results obtained by Monte Carlo simulation are compared and found in good agreement. 7 refs., 9 figs., 6 tabs.

16418 (JINR-E–3-94-128, pp. 28) **High resolution and high intensity neutron diffraction at the IBR-2 pulsed reactor.** Balagurov, A.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DIFFRACTOMETERS/small angle scattering; NEUTRON DIFFRACTOMETERS/time-of-flight method; IBR-2 REACTOR; NEUTRON DIFFRACTION; SPATIAL RESOLUTION

16419 (JINR-E–3-94-445) **The Dynamic Method for Time-of-Flight Measurement of Thermal Neutron Spectra from Pulsed Sources.** Pepelyshev, Yu.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Tulaev, A.B.; Bobrakov, V.F.; Chuklyaev, S.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 14p. Order Number DE95628042. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods in Physics Research. Section A, Accelerators, Spectrometers, Detectors and Associated Equipment.

The time-of-flight method for a measurement of thermal neutron spectra in the pulsed neutron sources with high efficiency of neutron registration, more than 10^5 times higher in comparison with traditional one, is described. The main problems connected with the electric current technique for time-of-flight spectra measurement are examined. The methodical errors, problems of a special neutron detector design and other questions are discussed. Some experimental results, spectra from surfaces of the water and solid methane moderators, obtained in the pulsed reactor IBR-2 (Dubna, Russia) are presented. 4 refs., 5 figs.

16420 (JINR-E–13-91-427) **Fourier transform microscope of the direct observation for nuclear emulsion.** Batusov, Yu.A.; Soroko, L.M.; Tereshchenko, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1991. 12p. Order Number DE95626967. Source: OSTI; NTIS (US Sales Only); INIS.

'The fourier transfom (FT) microscope of the direct observation' for tracks of charged particles in the nuclear emulsion is described. The working flow charts are given of the digital processing of the signals from the array of photodetectors disposed just behind the narrow transmitting slit in the FT plane. The general theory of this new device is presented. The net effect of the proposed processing algorithms is discussed. It is shown experimentally that with such a system we can detect the particle tracks with linear density of 40 silver grains per 100 μm with initial signal-to-noise ratio 1:3. The recommendations for the searching for the particle tracks of low ionization level in the nuclear emulsion by means of the FT microscope of the direct observation are described. 9 refs.; 15 figs.; 1 tab.

16421 (JINR-E–13-94-432) **A Study of Microstrip Gas Chamber Parameters.** Zanevskij, Yu.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Fateev, O.V.; Geltenbort, P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 8p. Order Number DE95628038. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pribory i Tekhnika Ehksperimenta.

A microstrip gas chamber built on the microstrip plate ILL-6C has been studied. A maximum gas gain of $2 \cdot 10^4$ and an energy resolution of 18% (FWHM) at 6 keV have been measured with an Ar-CH_4 gas mixture at atmospheric pressure. A spatial resolution about 500 mkm (FWHM) has been obtained using a delay line for the second coordinate readout. 3 refs., 6 figs.

16422 (JINR-E–15-94-471) **Large Area High-Efficiency Time-of Flight System for Detection of Low Energy Heavy Evaporation Residues at the Electrostatic Separator VASSILISSA.** Andreev, A.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Bashevoj, V.V.; Bogdanov, D.D. Joint Inst. for Nuclear Research, Dubna (Russian

Federation). Lab. of Nuclear Reactions. 1994. 12p. Order Number DE95628033. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods.

A large-area thin timing detector for slow heavy nuclei was developed. The apparatus is based on the transport of secondary electrons by micro-channel plate multipliers. To increase the registration efficiency secondary electrons are collected from the both sides of the emitter foil. An intrinsic time of (380±30) ps and registration efficiency of (95±5) % were obtained for the single TOF detector using ^{226}Ra α-source. A time resolution of (400±30) ps and registration efficiency close to 100% were measured for heavy ions for the single TOF detector. A time-of-flight system consisting of such detectors is extensively used in the experiments with heavy nuclei at the kinematic separator VASSILISSA [1,2]. 12 refs., 6 figs., 2 tabs.

16423 (JINR-R–3-94-447) **An Improved Experimental Facility for Studying Delayed Neutrons and Preliminary Results of Measuring the β_{eff} Value for ^{233}U Relative to ^{235}U.** Borzakov, S.B.; Dermendzhiev, Eh.; Zamyatnin, Yu.S.; Nazarov, V.M.; Pavlov, S.S.; Rogov, A.D.; Ruskov, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 13p. (In Russian). Order Number DE95628043. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Atomnaya Energiya.

An improved experimental facility for studying delayed neutron emission has been designed and tested at the Dubna IBR-2 pulsed reactor. The new facility consists of a mirror neutron guide to extract thermal and cold neutrons from the beam, a slow neutron chopper, which is synchronized with the reactor pulses and a 4π ^{3}He-filled multi counter neutron detector. The use of the slow neutron chopper allows the reactor delayed neutron background to be strongly suppressed. The repetition rate of the reactor pulse is 5 Hz with a half-width of about 215 μs. The weight of different fissile targets which are placed in the middle hole of the neutron detector can vary from 100 mg up to several grams. The mean thermal neutron flux on the target is about $2 \cdot 10^5$ n/sec·cm^2. A method of periodical irradiation of the target combined with the time-of-flight technique is used. The preliminary results on the effective fraction of delayed neutrons for ^{233}U relative to ^{235}U were obtained. The facility gives the possibility to measure β_{eff} value with the statistical accuracy better than 1% and to investigate DM groups with half-lives less than 1 second. 13 refs., 5 figs., 2 tabs.

16424 (JINR-R–10-94-434) **A Spectrometric System for Investigation of Magnetic States and Phase Transitions Induced by the Pulse Magnetic Field at the IBR-2 Reactor.** Georgiev, D.G.; Nitts, V.V.; Ostrovnoj, A.I.; Petukhova, T.B.; Sirotin, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 8p. (In Russian). Order Number DE95628034. Source: OSTI; NTIS (US Sales Only); INIS.

A spectrometric system of the SNIM-2 device for research at the IBR-2 reactor of magnetic states and phase transitions induced by the pulse magnetic field is described. The software provides: control of two channels for collection of a spectrometric information and registration of the monitor counts; remote control of moving mechanisms; control of the system for measurement and stabilisation of the temperature; automatic measurement of the angle dependence of the diffraction scattering intensity for the single crystal; control of the pulse magnetic facility; automatic orientation of the single crystal. The worked-out programs maintain the graphic mode and provide primary analysis of the spectrometric data. 11 refs., 1 fig.

16425 (JINR-R–13-94-394) **The Spectrometric Device for the Properties Study of Short Lived Nuclides.** Fominykh, V.I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Gromov, K.Ya.; Sehrehehtehr, Zh.; Yuldashev, M.B.; Wawryszczuk, Y.; Lewandowski, M.; Veselov, G.V.; Potempa, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 16p. (In Russian). Order Number DE95626943. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pribory i Tekhnika Ehksperimenta.

Multi parametric spectrometer for the investigation of alpha, beta-single and EEt-coincidence spectra is described. The spectrometer is used for studies of short lived nuclides ($T_1/2 \geq 1$ s) on the experimental complex YASNAPP-2 working on-line with 660 MeV proton beam of the JINR Phasotron. The semiconductor and scintillation detectors included in the device allowed to solve many problems on radioactive nuclear property investigations as for example the studies of nuclear decay schemes, the measurements of alpha, beta-decay energies and nuclear states time of life and so on. (author). 17 refs., 7 figs.

16426 (LA-UR–95-107) **Detection of contaminants along boreholes with prompt gamma spectroscopy.** Conaway, J. (Los Alamos National Lab., NM (United States)); George, D.; Mikesell, J. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950601–4: Annual meeting of the American Nuclear Society, Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95006297. Source: OSTI; NTIS; INIS; GPO Dep.

Geophysical borehole logging techniques are used for estimating subsurface physical, chemical, geological, and hydrological parameters. Nuclear borehole logging techniques have advantages and disadvantages that tend to be complementary to those of physical sampling and these in situ measurements can help address the drawbacks of physical sampling, including high costs, lengthy delays in obtaining results of analyses from laboratories/under sampling, sample handling problems, and ambiguity in long-term monitoring. As part of an effort to reduce environmental restoration costs, we are evaluating in-situ neutron-induced gamma-ray spectroscopy (multispectral) measurements in boreholes to map environmental contaminants. It has been known for some time that this technology is capable of identifying many elements, but earlier borehole equipment was not very sensitive.

16427 (LA-UR–95-1092) **The performance of neutron scattering spectrometers at a long-pulse spallation source.** Pynn, R. Los Alamos National Lab., NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9504136–1: Long-pulse spallation source (LPSS) workshop, Berkeley, CA (United States), Apr 1995). Order Number DE95009492. Source: OSTI; NTIS; INIS; GPO Dep.

The first conclusion the author wants to draw is that comparison of the performance of neutron scattering spectrometers at CW and pulsed sources is simpler for long-pulsed sources than it is for the short-pulse variety. Even though detailed instrument design and assessment will require Monte Carlo simulations (which have already been performed at Los Alamos for SANS and reflectometry), simple arguments are sufficient to assess the approximate performance of spectrometers at an LPSS and to support the contention that a 1 MW long-pulse source can provide attractive performance, especially for instrumentation designed for soft-condensed-matter science. Because coupled moderators can be exploited at such a source, its time average cold flux is equivalent to that of a research reactor with a power of about 15 MW, so only a factor of 4 gain from source pulsing is necessary to obtain performance that is comparable with the ILL. In favorable cases, the gain from pulsing can be even more than this, approaching the limit set by the peak flux, giving about 4 times the performance of the ILL. Because of its low duty factor, an LPSS provides the greatest performance gains for relatively low resolution experiments with cold neutrons. It should thus be considered complementary to short pulse sources which are most effective for high resolution experiments using thermal or epithermal neutrons.

16428 (MPI-PhE–94-34) **Study of a novel electromagnetic liquid argon calorimeter - the TGT.** Berger, C. (Technische Hochschule Aachen (Germany). 1. Physikalisches Inst.); Braunschweig, W.; Geulig, E.; Schoentag, M.; Siedling, R.; Wlochal, M. RD33 Collaboration. Max-Planck-Institut fuer Physik, Muenchen (Germany). Nov 1994. 23p. (PITHA–94-51; HD-IHEP–94-07). Order Number DE95768934. Source: OSTI; NTIS (US Sales Only); INIS.

The concept and the basic design of a fast, highly granular and compact electromagnetic liquid argon calorimeter are described. This novel calorimeter offers uniform energy response and constant energy resolution independent of the production angle of an impinging particle and of its impact position at the calorimeter. An example of a calorimeter with full rapidity coverage in an application in a collider detector is given. An important aspect of the concept is the electronics for fast signal processing matched to the

short charge collection time. We report on the experience with the realization of a prototype calorimeter module and on its performance in a testbeam exposure. (orig.)

16429 (MPI-PhE–95-03) **Testing and further development of a low-noise SI radiation detector.** Pho Duc, C. Max-Planck-Institut fuer Physik, Muenchen (Germany); Muenchen Univ. (Germany). Sektion Physik. Feb 1995. 78p. (In German). Order Number DE95768483. Source: OSTI; NTIS (US Sales Only); INIS.

The functionality of a double DEP-MOSFET was proved, and the attempted improvement of energy resolution was achieved by controlling the signal electrons. The numerical simulation of the detector function provided important information for this. The experiment was caried out as an independent project with specially developed hardware and software. In particular, the absolute mesasurement of the output signal with subsequent data analysis was implemented, which is necessary for multiple selection. On the basis of the experimental findings, conclusions are drawn for the further development of this detector concept.

16430 Directional fast-neutron detector. Byrd, R.C. To Dept. of Energy. 1993. Filed date 29 Mar 1993. U.S. Patent Application 8-038-320. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009987. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A plurality of omnidirectional radiation detectors are arranged in a close packed symmetrical pattern to form a segmented detector. The output radiation counts from these detectors are arithmetically combined to provide the direction of I a source of incident radiation. Directionality is achieved without the use of shielding to provide collimation and background reduction effects. Indeed, output counts from paired detectors are simply subtracted to yield a vector direction toward the radiation source. The counts from all of the detectors can be combined to yield an output signal functionally related to the radiation source strength.

16431 (PTB-E–51) **Electron spin resonance (ESR) spectroscopy applied to radiation dosimetry and other fields.** Schneider, C.C.J. Physikalisch-Technische Bundesanstalt, Braunschweig (Germany). Abt. Elektrizitaet. Dec 1994. 59p. Order Number DE95768503. Source: OSTI; NTIS (US Sales Only); INIS.

A short introduction to the theory and practice of ESR spectroscopy is given. ESR alanine dosimetry for low and high LET (linear energy transfer) ionising radiation is described, indicating its advantages over traditional methods. Problems arising in the therapy dose range (below 5 Gy), and possible future developments, are mentioned. The application of ESR to the radiation processing of materials and foodstuffs, to geological dating, biology, molecular chemistry and to medicine is discussed. Some examples of chemical analyses are also presented. (orig.)

16432 (PTB-N–21) **Calculations of the response of Bonner spheres with a spherical ^{3}He proportional counter using a realistic detector model.** Wiegel, B.; Alevra, A.V.; Siebert, B.R.L. Physikalisch-Technische Bundesanstalt, Braunschweig (Germany). Neutronenphysik. Nov 1994. 92p. Order Number DE95768522. Source: OSTI; NTIS (US Sales Only); INIS.

A realistic geometry model of a Bonner sphere system with a spherical ^{3}He-filled proportional counter and 12 polyethylene moderating spheres with diameters ranging from 7,62 cm (3") to 45,72 cm (18") is introduced. The MCNP Monte Carlo computer code is used to calculate the responses of this Bonner sphere system to monoenergetic neutrons in the energy range between 1 meV to 20 MeV. The relative uncertainties of the responses due to the Monte Carlo calculations are less than 1% for spheres up to 30,48 cm (12") in diameter and less than 2% for the 15" and 18" spheres. Resonances in the carbon cross section are seen as significant structures in the response functions. Additional calculations were made to study the influence of the ^{3}He number density and the polyethylene mass density on the response as well as the angular dependence of the Bonner sphere system. The calculated responses can be adjusted to a large set of calibration measurements with only a single fit factor common to all sphere diameters and energies. (orig.)

16433 (SINS–2146/6) **The influence of upstream material on the performance of an electromagnetic calorimeter inside a magnetic field.** Doroba, K. (Warsaw Univ. (Poland). Inst. Fizyki Doswiadczalnej); Krolikowski, J.; Fischer, H.G.; Szeptycka, M.; Szymanski, P. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). May 1993. 13p. Grant KBN 20963 91 01. Order Number DE95628790. Source: OSTI; NTIS; INIS.

The deterioration of the calorimeter response to electrons in the presence of upstream materials has been investigated inside a magnetic field. Data for different absorber thickness, distances and electron energies are compared to Monte Carlo calculations. Results are extended to the geometrical situation of a typical collider detector. (author). 4 refs, 11 figs, 1 tab.

16434 (UCRL-JC–117141) **Development of a portable ambient temperature radiometric assaying instrument.** Lavietes, A.D.; McQuaid, J.H.; Ruhter, W.D. Lawrence Livermore National Lab., CA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941061–19: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 nov 1994). Order Number DE95009566. Source: OSTI; NTIS; INIS; GPO Dep.

There is a strong need for portable radiometric instrumentation that can accurately confirm the presence of nuclear materials and allow isotopic analysis of radionuclides in the field. To fulfill this need we are developing a hand-held, non-cryogenic, low-power gamma- and x-ray measurement and analysis instrument that can both search and then accurately verify the presence of nuclear materials. We report on the use of cadmium zinc telluride detectors, signal processing electronics, and the new field-portable instrument based on the MicroNOMAD Multichannel Analyzer from EG&G ORTBC. We also describe the isotopic analysis that allows uranium enrichment measurements to be made accurately in the field.

16435 (UCRL-JC–117142) **Characterization inconsistencies in CdTe and CZT gamma-ray detectors.** Lavietes, A.D.; McQuaid, J.H. Lawrence Livermore National Lab., CA (United States). Oct 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941061–18: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 nov 1994). Order Number DE95009567. Source: OSTI; NTIS; INIS; GPO Dep.

In the past few years, significant developments in cadmium telluride (CdTe) and cadmium zinc telluride (CZT) semiconductor materials have taken place with respect to both quality and yield. Many of the more recent developments have occurred in the area of CZT crystal growth. This has resulted in an explosion of interest in the use of these materials in ambient temperature gamma-ray detectors. Most, if not all, of the manufacturers of CdTe and CZT have acquired government funding to continue research in development and applications, indicating the importance of these improvements in material quality. We have examined many detectors, along with the accompanying manufacturer's data, and it has become apparent that a clear standard does not exist by which each manufacturer characterizes the performance of their material. Result is a wide variety of performance claims that have no basis for comparison and normally cannot be readily reproduced. This paper first supports our observations and then proposes a standard that all manufacturers and users of these materials may use for characterization.

16436 (UCRL-JC–118444) **Computer-controlled radiation monitoring system.** Homann, S.G. Lawrence Livermore National Lab., CA (United States). 27 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941129–22: 13. international conference on the application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95009871. Source: OSTI; NTIS; INIS; GPO Dep.

A computer-controlled radiation monitoring system was designed and installed at the Lawrence Livermore National Laboratory's Multiuser Tandem Laboratory (10 MV tandem accelerator from High Voltage Engineering Corporation). The system continuously monitors the photon and neutron radiation environment associated with the facility and automatically suspends accelerator operation if preset radiation levels are exceeded. The system has proved reliable

real-time radiation monitoring over the past five years, and has been a valuable tool for maintaining personnel exposure as low as reasonably achievable.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

16437 (IFVE-ONF–93-95) **Radiation resistance of GaAs structures with built-in π-ν junction.** Vorob'ev, A.P. (Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation)); Krupnyj, G.I.; Rastsvetalov, Ya.N. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 14p. (In Russian). Order Number DE95628819. Source: OSTI; NTIS (US Sales Only); INIS.

The results of studying GaAs samples with build-in π-ν-junction as the base for the construction of the radiation resistant coordinate sensitive detectors are presented. The GaAs samples have been exposed to the beam of the IHEP linear proton accelerator, using Al target for neutron production. The 4-characteristics of GaAs samples have been analyzed to search for the change of its properties. The study of the radiation resistance of the GaAs samples has shown that their main characteristics (charge collection efficiency, signal/noise ratio) degrade less than 20% at the integral neutron fluence of 1.2×10^{15} cm^{-2}. 10 refs., 12 figs., 2 tabs.

16438 (SAND–94-2519C) **Frequency response of a TeO_2 slow shear wave acousto-optic cell exposed to radiation.** Erteza, I.A. (Sandia National Labs., Albuquerque, NM (United States). Optical Systems and Image Processing Dept.); Craft, D.C.; Stalker, K.T.; Taylor, E.W.; Kelley, M.A.; Sanchez, A.D.; Chapman, S.P.; Craig, D.M.; Kinsley, E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by Defense Nuclear Agency, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Proposal 91930113. (CONF-950472–5: SPIE international symposium on aerospace/defense sensing and dual-use photonics, Orlando, FL (United States), 17-21 Apr 1995). Order Number DE95009588. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation testing of photonic components is not new, however component level testing to date has not completely addressed quantities which are important to system behavior. One characteristic that is of particular importance for optical processing systems is the frequency response. In this paper, the authors present the results of the analysis of data from an experiment designed to provide a preliminary understanding of the effects of radiation on the frequency response of acousto-optic devices. The goal is to present possible physical mechanisms responsible for the radiation effects and to discuss the effects on signal processing functionality. The experiment discussed in this paper was designed by Sandia National Laboratories (SNL) and performed by SNL and Phillips Laboratory (PL) personnel at White Sands Missile Range (WSMR). In the experiment, a TeO_2 slow shear-wave acousto-optic cell was exposed to radiation from the WSMR linear accelerator. The TeO_2 cell was placed in an experimental configuration which allowed swept frequency diffracted power measurements to be taken during radiation exposure and recovery. A series of exposures was performed. Each exposure consisted of between 1 to 800, 1 μsec radiation pulses (yielding exposures of 2.25 kRad(Si) to 913 kRad(Si)), followed by recovery time. At low total and cumulative doses, the bandshape of the frequency response (i.e. diffracted power vs. frequency) remained almost identical during and after radiation. At the higher exposures, however, the amplitude and width of the frequency response changed as the radiation continued, but returned to the original shape slowly after the radiation stopped and recovery proceeded. It is interesting to note that the location of the Bragg degeneracy does not change significantly with radiation. In this paper, the authors discuss these effects, and they discuss the effect on the signal processing functionality.

16439 (SINS–2148/4) **Radiation hardness of some semiconductor devices produced in Poland to fast neutrons. Pt. 1. Diodes and transistors.** Bouzyk, J. (Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland)); Augustyniak, E.; Hammer, W. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). Jun 1993. 21p. (In Polish). Order Number DE95628821. Source: OSTI; NTIS; INIS.

The paper presents the results of hardness studies of semiconductor devices produced in Poland. Representative measured parameters of 9 electronic components irradiated with fission. D-Be and D-T neutrons with fluencies in the range of 10^{11} - 10^{14} n/cm^2 are given. The results are discussed and lead to the general conclusion that the operation of the semiconductor devices is seriously affected by neutrons with fluences of the order of 10^{13} n/cm^2, some components fail completely at 10^{14} n/cm^2. The radiation damage models of diodes and transistors have been used to calculate the damage coefficients. Ratios of coefficients for the neutrons of 14.7 MeV and fission ones calculated for the transistors and diode are 1.8 and 2.3 respectively. (author). 9 refs, 3 figs, 2 tabs.

16440 (SINS–2149/4) **Radiation hardness of some semiconductor devices produced in Poland to fast neutrons. Pt. 2. Integrated circuits.** Bouzyk, J. (Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland)); Augustyniak, E.; Hammer, W. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). 1993. 16p. (In Polish). Order Number DE95628822. Source: OSTI; NTIS; INIS.

The paper presents the results of hardness studies of semiconductor devices produced in Poland. Representative measured parameters of 9 electronic components irradiated with fission, D-Be and D-T neutrons with fluencies in the range of 10^{11} - 10^{14} n/cm^2 are given. The results are discussed and lead to the general conclusion that the operation of the semiconductor devices is seriously affected by neutrons with fluences of the order of 10^{13} n/cm^2, some components fail completely at 10^{14} n/cm^2. The radiation damage models of diodes and transistors have been used to calculate the damage coefficients. Ratios of coefficients for the neutrons of 14.7 MeV and fission ones calculated for the transistors and diode are 1.8 and 2.3 respectively. (author). 7 refs, 8 figs, 2 tabs.

16441 (UCRL-ID–114325) **Single event and TREE latchup mitigation for a star tracker sensor: An innovative approach to system level latchup mitigation.** Kimbrough, J.R. (Lawrence Livermore National Lab., CA (United States)); Colella, N.J.; Davis, R.W.; Bruener, D.B.; Coakley, P.G.; Lutjens, S.W.; Mallon, C.E. Lawrence Livermore National Lab., CA (United States). Aug 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010331. Source: OSTI; NTIS; INIS; GPO Dep.

Electronic packages designed for spacecraft should be fault-tolerant and operate without ground control intervention through extremes in the space radiation environment. If designed for military use, the electronics must survive and function in a nuclear radiation environment. This paper presents an innovative "blink" approach rather than the typical "operate through" approach to achieve system level latchup mitigation on a prototype star tracker camera. Included are circuit designs, flash x-ray test data, and heavy ion data demonstrating latchup mitigation protecting micro-electronics from current latchup and burnout due to Single Event Latchup (SEL) and Transient Radiation Effects on Electronics (TREE).

4404 Well Logging Instrumentation

16442 (NEI-NO–541) **Improved reservoir monitoring in HPHT wells.** Godager, Oe. (Smedvig Technology A/S, Toensberg (Norway)); Schmidt, H. Norsk Petroleumsforening, Oslo (Norway). 1994. 8p. (CONF-9408229–48: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766617. Source: OSTI; NTIS.

The conference paper deals with the development of a Dual-channel HPHT (High Pressure/High Temperature) Crystal Quartz Pressure Gauge (DSQPP) instrument. The small-sized instrument can be used in well conditions as high as 1250 Bar and 180°C and with stated accuracies of 0.015% full scale. The instrument characteristics show the ability of measuring correct pressure during thermal gradient periods, and is to be rugged and intensive to the effects of shock, vibration, and radial acceleration. The instrument is able to operate in a continuous on-line monitoring mode or as a high-capacity digital memory pressure-temperature recorder. The paper describes the development, performance parameters, testing, and use of the DSQPP pressure gage in an HPHT well in the Norwegian sector of the North Sea. 2 refs., 7 figs.

16443 (NEI-NO–543) **Advances of MWD technology for HPHT wells.** Llosa, R. (Anadrill International (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 13p. (CONF-9408229–50: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766619. Source: OSTI; NTIS.

The conference paper describes a new MWD (Measurements While Drilling) tool designed to meet the demanding requirements in the drilling of HPHT (High Pressure/High Temperature) wells. 3 refs., 7 figs., 3 tabs.

16444 (NEI-NO–548) **Benefits and technological status of multiphase flow meters for topside and subsea application.** Svaeren, J.A. (Framo Engineering (Norway)). Norsk Petroleumsforening, Oslo (Norway). 1994. 40p. (CONF-9408229–55: ONS '94: 11. international Offshore Northern Seas conference and exhibition, Stavanger (Norway), 23-26 Aug 1994). Order Number DE95766624. Source: OSTI; NTIS.

The conference paper discusses multiphase flow meters commercially available. According to the author, the accuracy of todays meters are better than test separators. Flow meters can dramatically improve field development economics both for topside and subsea application, they can improve field recovery rates and thereby largely improve field economics, and they can, due to relaxation on fiscal consideration, play an important role in cost effective allocation metering in tie-in of satellite fields to existing infrastructure. 21 figs., 8 tabs.

4405 Thermal Instrumentation

Refer also to citation(s) 16387

4406 Optical Instrumentation

Refer also to citation(s) 15171, 16279

16445 **Ground plane insulating coating for proximity focused devices.** Power, G.D. To Dept. of Energy. 1993. Filed date 5 Mar 1993. U.S. Patent Application 8-026,797. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009976. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This invention is comprised of a thin layer of alumina (aluminum oxide) which is coated onto the ground plane of a microchannel plate (MCP) without covering the pores of the MCP so it does not effect the performance. The coating is sputtered onto the ground plane at a very steep angle. The addition of the thin dielectric coating of alumina greatly improves the spatial resolution of proximity focused image intensifiers using a narrow gap between the phosphor screen and the MCP. With the coating on the ground plane and the same gap the phosphor screen can be ran at 9000 volts, as compared to 3kV without the coating.

16446 (SAND–95-0588C) **Current trends in the packaging of photonic devices.** Carson, R.F. Sandia National Labs., Albuquerque, NM (United States). [1995]. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504140–1: Spring meeting on optoelectronic and photonic devices, Tucson, AZ (United States), 6 Apr 1995). Order Number DE95009583. Source: OSTI; NTIS; GPO Dep.

Optoelectronic and photonic devices hold great promise for high data-rate communication and computing. Their wide implementation was limited first by the device technologies and now suffers due to the need for high-precision packaging that is mass-produced. The use of photons as a medium of communication and control implies a unique set of packaging constraints that are highly driven by the need for micron and even sub-micron alignments between photonic devices and their transmission media. Current trends in optoelectronic device packaging are reviewed and future directions are identified both for free-space (3-dimensional) and guided-wave (2-dimensional) photonics. Emphasis will be placed on the special needs generated by increasing levels of device integration.

16447 (SAND–95-0670C) **Sandia National Lab's precision laser tracking systems.** Patrick, D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9506174–1: Test Facility working group conference, Las Vegas, NV (United States), 12-16 Jun 1995). Order Number DE95009837. Source: OSTI; NTIS; GPO Dep.

Sandia Labs' mobile tracking systems have only one moving part. The double gimballed 18 inch diameter beryllium mirror is capable of constant tracking velocities up to 5 rads/sec in both axes, and accelerations to 150 rads/sec/sec in both axes. Orthogonality is <10 microradians. The mirror directs the 488 and 514 nm wavelength CW laser beams to adhesive-backed reflective material applied to the test unit. The mirror catches the return beam and visual image, directing the visual image to three camera bays, and the return beam to an image dissector behind an 80 inch gathering telescope. The image dissector or image position sensor is a photomultiplier with amplifying drift tube and electron aperture and its associated electronics. During the test, the image dissector scan senses the change in position of the reflective material and produces signals to operate the azimuth and elevation torque motors in the gimbal assembly. With the help of 1 1/8 inch diameter azimuth and elevation galvonometer steering mirrors in the optical path, the laser beam is kept on the target at extremely high velocities. To maintain a constant return signal strength, the outgoing beam is run through a microprocessor controlled beam focusing telescope.

16448 (SAND–95-0721C) **Scannerless range imaging with a square wave.** Muguira, M.R.; Sackos, J.T.; Bradley, B.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950472–6: SPIE international symposium on aerospace/defense sensing and dual-use photonics, Orlando, FL (United States), 17-21 Apr 1995). Order Number DE95009840. Source: OSTI; NTIS; GPO Dep.

Scannerless range imaging (SRI) is a unique approach to three dimensional imaging without scanners. SRI does, however, allow a more powerful light source to be used as compared to conventional Laser Radar (LADAR) systems due to the speed of operation associated with this staring system. As a result, a more efficient method of operation was investigated. As originally conceived, SRI transmits a continuous intensity modulated sinusoidal signal; however, a square wave driver is more energy efficient than a sinusoidal driver. In order to take advantage of this efficiency, a square wave operational methodology was investigated. As a result, four image frames are required for the extraction of range using a square wave to unambiguously resolve all time delays within one time period compared to a minimum of three frames for the sinusoidal wave.

16449 (UCRL-ID–119706) **Production and preliminary testing of multianalyte imaging sensor arrays.** Richards, J.B. (Lawrence Livermore National Lab., CA (United States)); Brown, S.B.; Milanovich, F.P.; Healey, B.G.; Chadha, S.; Walt, D.R. Lawrence Livermore National Lab., CA (United States). Nov 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009468. Source: OSTI; NTIS; GPO Dep.

This report covers the production and preliminary testing of fiber optic sensors that contain a discrete array of analyte specific sensors on their distal ends. The development of the chemistries associated with this technology is covered elsewhere.

4407 Geophysical and Meteorological Instrumentation

Refer also to citation(s) 15336, 16489, 16494, 16495

4408 Miscellaneous Instrumentation

Refer also to citation(s) 14771, 15171, 15720, 15722, 15723, 15724, 15725, 16161, 16223, 16224, 16225, 16226, 16228, 16229, 16377, 16555

16450 (DOE/ET/15601–T66) **Diagnostic development and support of MHD test facilities. Technical progress report, April 1992–June 1992.** Shepard, W.S.; Cook, R.L. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. [1995]. 53p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC02-80ET15601. Order Number DE95009822. Source: OSTI; NTIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL) at Mississippi State University (MSU) is developing diagnostic instruments for magnetohydrodynamic (MHD) power train data acquisition and for support of MHD component development test facilities. Microprocessor-controlled optical instruments, initially developed for Heat Recovery/Seed Recovery (HRSR) support, are being refined, and new systems to measure temperatures and gas-seed-slag stream characteristics are being developed. To further data acquisition and analysis capabilities, the diagnostic systems are being interfaced with DIAL's computers. Technical support for the diagnostic needs of the national MHD research effort is being provided. DIAL personnel also cooperate with government agencies and private industries to improve the transformation of research and development results into processes, products and services applicable to their needs.

16451 Sonication standard laboratory module. Beugelsdijk, T.; Hollen, R.M.; Erkkila, T.H.; Bronisz, L.E.; Roybal, J.E. To Dept. of Energy. 1993. Filed date 24 Mar 1993. U.S. Patent Application 8-036,581. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009984. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A Standard Laboratory Module for automatically producing a solution of contaminants from a soil sample. A sonication tip agitates a solution containing the soil sample in a beaker while a stepper motor rotates the sample. An aspirator tube, connected to a vacuum, draws the upper layer of solution from the beaker through a filter and into another beaker. This beaker can thereafter be removed for analysis of the solution.

16452 (SAND–95-0389) **Folded Compact Range Development and Coherent Change Detection Measurement Project.** Sorensen, K.W. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009082. Source: OSTI; NTIS; GPO Dep.

A novel, folded compact range configuration has been developed at the Sandia National Laboratories compact range antenna and radar cross section measurement facility, operated by the Radar/Antenna Department 2343, as a means of performing indoor, environmentally-controlled, far-field simulations of synthetic aperture radar (SAR) coherent change detection (CCD) measurements. This report describes the development of the folded compact range configuration, as well as the initial set of coherent change detection measurements made with the system. These measurements have been highly successful, and have demonstrated the viability of the folded compact range concept in simulating SAR CCD measurements. It is felt that follow-on measurements have the potential of contributing significantly to the body of knowledge available to the scientific community involved in CCD image generation and processing, and that this tool will be a significant aid in the research and development of change detection methodologies.

16453 (UCRL-JC–119292) **High-resolution superconducting x-ray spectrometers with aluminum trapping layers of different thicknesses.** Mears, C.A. (Lawrence Livermore National Lab., CA (United States)); Labov, S.E.; Miller, L.H.; Frank, M.; Netel, H.; Azgui, F.; Barfknecht, A.T. Lawrence Livermore National Lab., CA (United States). Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. Contract NAS5-38013; Grant NAGW-3907. (CONF-941013–35: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95010253. Source: OSTI; NTIS; GPO Dep.

Superconducting tunnel junctions coupled to superconducting absorbers may be used as high-resolution, high-efficiency x-ray spectrometers. We have tested devices with niobium x-ray absorbing layers coupled to aluminum layers that serve as quasiparticle traps. We present a study of device performance as a function of thickness of the trapping layers. We measured the best energy resolution using a device with a high-quality barrier and 200 nm-thick trapping layers on both sides of the tunnel barrier. This energy resolution was 36 eV full width at half maximum at 6 keV, about 4 times better than that obtainable using semiconductor ionization detectors.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

Refer also to citation(s) 16518

16454 (ANL/ESD/TM–85) **Interim progress report addendun - environmental geophysics: Building E5032 decommissioning, Aberdeen Proving Ground, January 1994 resurvey.** Thompson, M.D.; McGinnis, L.D.; Benson, M.A.; Borden, H.M.; Padar, C.A. Argonne National Lab., IL (United States). Dec 1994. 20p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009318. Source: OSTI; NTIS; GPO Dep.

Geophysical surveying around Building E5032 using three new continuously recording geophysical instruments - two types of electromagnetic induction instruments and a cesium vapor magnetometer that were unavailable at the time of the original survey - has provided additional information for defining the location of buried debris, vaults, tanks, and the drainage/sump system near the building. The dominant geophysical signature around Building E5032 consists of a complex pattern of linear magnetic, electrical-conductivity, and electromagnetic field anomalies that appear to be associated with drainage/sewer systems, ditches, past railway activity, the location for Building T5033 (old number 99A), and the probable location of Building 91. Integrated analysis of data acquired using the three techniques, plus a review of the existing ground-penetrating-radar data, allow a more thorough definition of the sources for the observed anomalies.

16455 (FASAC-TAR–95009045) **Non-US electrodynamic launchers research and development.** Parker, J.V.; Batteh, J.H.; Greig, J.R.; Keefer, D.; McNab, I.R.; Zabar, Z. Science Applications International Corp., McLean, VA (United States). Foreign Applied Sciences Assessment Center. Nov 1994. 306p. Source: OSTI; OSTI; Science Applications International Corp., 1710 Goodridge Drive, P.O. Box 1303, McLean, VA 22102.

Electrodynamic launcher research and development work of scientists outside the United States is analyzed and assessed by six internationally recognized US experts in the field of electromagnetic and electrothermal launchers. The assessment covers five broad technology areas: (1) Experimental railguns; (2) Railgun theory and design; (3) Induction launchers; (4) Electrothermal guns; (5) Energy storage and power supplies. The overall conclusion is that non-US work on electrodynamic launchers is maturing rapidly after a relatively late start in many countries. No foreign program challenges the US efforts in scope, but it is evident that the United States may be surpassed in some technologies within the next few years. Until recently, published Russian work focused on hypervelocity for research purposes. Within the last two years, large facilities have been described where military-oriented development has been underway since the mid-1980s. Financial support for these large facilities appears to have collapsed, leaving no effective effort to develop practical launchers for military or civilian applications. Electrodynamic launcher research in Europe is making rapid progress by focusing on a single application, tactical launchers for the military. Four major laboratories, in Britain, France, Germany, and the Netherlands, are working on this problem. Though narrower in scope than the US effort, the European work enjoys a continuity of support that has accelerated its progress. The next decade will see the deployment of electrodynamic launcher technology, probably in the form of an electrothermal-chemical upgrade for an existing gun system. The time scale for deployment of electromagnetic launchers is entirely dependent on the level of research-and-development effort. If resources remain limited, the advantage will lie with cooperative efforts that have reasonably stable funding such as the present French-German program.

16456 (LA-UR–95-176) **Assay of potentially contaminated propellant.** Koster, J.E. (Los Alamos National Lab., NM (United States)); Williams, H.E. III; Scott, W.S. Los Alamos National Lab.,

NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216–114: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006330. Source: OSTI; NTIS; GPO Dep.

One of the decontamination and decommissioning projects within DOD is demilitarization of an aging stockpile of munitions. A large portion of the stockpile contains depleted uranium (DU) as an armor piercing core and so these munitions must be assayed for the presence of uranium in other components. The assay method must be fast and preferably easy to implement. Presence of DU is indicated by its alpha decay. The alpha particles in turn produce ions in the ambient air. If a significant fraction of these ions can escape the quantity of propellant, the ions can be detected instead of the alpha particles. As a test of the feasibility of detecting alpha emissions from DU somewhere within a cartridge of propellant, the transmission of ions through layers of real propellant was measured. The propellant is in the form of graphite-coated cylindrical pellets. A 105nun cartridge was modified for use as a pellet chamber. A check source served as an ion source. The ion detector consisted of a grid held at 300V coupled to an ammeter. Results confirm that this is a promising technique for testing the propellant for the presence of DU quickly yet with sensitivity.

16457 (SAND–94-2373C) **Storage life of parachutes – long time material degradation.** Ericksen, R.H.; Whinery, L.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950550–1: 13. aerodynamics decelerator systems technology conference, Clearwater, FL (United States), 15-19 May 1995). Order Number DE95009576. Source: OSTI; NTIS; GPO Dep.

This study considers the long-time storage of single-use nylon and Kevlar® parachutes. The authors present data from a 29-year-old nylon parachute, and nylon and Kevlar® test samples stored 14 years under ambient conditions in the absence of sunlight. They compare the results with existing predictions of parachute material degradation and other aging data. X-ray photoelectron spectroscopy analyses were preformed on Nylon and Kevlar® fabrics that were degraded by elevated temperature aging. The results suggest that this technique should be further examined as a "non-destructive" method of detecting degradation.

16458 (SAND–95-0438C) **Advanced product realization through model-based design and virtual prototyping.** Andreas, R.D. (Sandia National Labs., Albuquerque, NM (United States). Electronic Subsystems Center). Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States);American Society of Mechanical Engineers, New York, NY (United States). DOE Contract AC04-94AL85000. (CONF-9503112–1: Agile Manufacturing conference (AMC '95), Albuquerque, NM (United States), 16-17 Mar 1995). Order Number DE95008544. Source: OSTI; NTIS; GPO Dep.

Several government agencies and industrial sectors have recognized the need for, and payoff of, investing in the methodologies and associated technologies for improving the product realization process. Within the defense community as well as commercial industry, there are three major needs. First, they must reduce the cost of military products, of related manufacturing processes, and of the enterprises that have to be maintained. Second, they must reduce the time required to realize products while still applying the latest technologies. Finally, they must improve the predictability of process attributes, product performance, cost, schedule and quality. They must continue to advance technology, quickly incorporate their innovations in new products and in processes to produce them, and they need to capitalize on the raw computational power and communications bandwidth that continues to become available at decreasing cost. Sandia National Laboratories initiative is pursuing several interrelated, key concepts and technologies in order to enable such product realization process improvements: model-based design; intelligent manufacturing processes; rapid virtual and physical prototyping; and agile people/enterprises. While progress in each of these areas is necessary, this paper only addresses a portion of the overall initiative. First a vision of a desired future capability in model-based design and virtual prototyping is presented. This is followed by a discussion of two specific activities parametric design analysis of Synthetic Aperture Radars (SARs) and virtual prototyping of miniaturized high-density electronics – that exemplify the vision as well as provide a status report on relevant work in progress.

16459 (UCRL-ID–118619) **Transfer of Air Force technical procurement bid set data to small businesses, using CALS and EDI: Test report.** Lawrence Livermore National Lab., CA (United States). 15 Aug 1994. 541p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (AITI–93-ED-01). Order Number DE95009610. Source: OSTI; NTIS; GPO Dep.

This report documents a test transfer of three Air Force technical procurement bid sets to one large and twelve small businesses, using the Department of Defense (DoD) Continuous Acquisition and Life-cycle Support (CALS) and ANSI ASC X12 Electronic Data Interchange (EDI) standards. The main goal of the test was to evaluate the effectiveness of using CALS technical data within the context of the DoD's EDI-based standard approach to electronic commerce in procurement, with particular emphasis on receipt and use of the data by small contractors. Air Force procurement data was provided by the Sacramento Air Logistics Center at McClellan Air Force Base; the manufacturing participants were selected from among McClellan's "Blue Ribbon" contractors, located throughout the US. The test was sponsored by the Air Force CALS Test Network, headquartered at Wright-Patterson Air Force Base. The test successfully demonstrated the technical feasibility of including CALS MIL-R-28002 (Raster) engineering data in an EDI Specification/Technical Information transaction set (ANSI ASC X12 841) when issuing electronic requests for quotation to small businesses. In many cases, the data was complete enough for the contractor participant to feel comfortable generating a quote. Lessons learned from the test are being fed back to the CALS and EDI standards organizations, and to future implementors of CALS-EDI based acquisition or contracting systems, which require the transfer of technical information, such as engineering data, manufacturing process data, quality test data, and other product or process data, in the form of a CALS or other digital datafile.

4501 Chemical Explosions and Explosives

Refer also to citation(s) 15655, 16192, 16204, 16476, 16563, 16711

16460 (LA-UR–95-841) **Biomorphic robots as a persistent means for removing explosive mines.** Tilden, M.W. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505197–1: Autonomous vehicles in mine countermeasures symposium, Monterey, CA (United States), 5 May 1995). Order Number DE95009433. Source: OSTI; NTIS; GPO Dep.

The current variety and dispersion of explosive mines is a daunting technological problem for current sensory techniques. The bottom line is that the only way to insure a mine has been found and removed is to step on it. As this is an upsetting proposition for biological organisms like animals or children, this paper details a proposed non-biological method that may have validity following additional research into the new science of Biomorphic Machines. A Robobiologist at LANL has invented and developed a variety of "living" robots that are solar powered, legged, autonomous, adaptive to massive damage and terrain, and very inexpensive. This technology, called Nervous Net (Nv) design, allows for the creation of capable walking mechanisms (known as "Biomorphic Robots") which rather than run on a "work" ethic, use "survivalist" design principles. These principles allow Nv based machines to continue doing work even after multiple limbs have been removed or damaged, and to dynamically negotiate complex terrains as an emergent property of their operation. They are not programmed, and indeed, the 12 transistor controller used keeps their electronic cost well below that of most pocket radios. It is suspected that in finding and removing randomly placed explosive mines, they may be an interesting, capable solution.

16461 (LA-UR–95-1074) **Base hydrolysis and hydrothermal processing of PBX-9404 explosive.** Sanchez, J.A.; Flesner, R.L.;

Spontarelli, T.; Dell'Orco, P.C.; Kramer, J.F. Los Alamos National Lab., NM (United States). [1994]. 14p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941255–3: Life cycles of energetic materials, Del Mar, CA (United States), 11-16 Dec 1994). Order Number DE95009497. Source: OSTI; NTIS; GPO Dep.

Base hydrolysis in combination with hydrothermal processing has been proposed as an environmentally acceptable alternative to open burning/open detonation for degradation and destruction of high explosives. In this report, we examine gaseous and aqueous products of base hydrolysis of the HMX-based plastic bonded explosive, PBX-9404. We also examine products from the subsequent hydrothermal treatment of the base hydrolysate. The gases produced from hydrolysis of PBX-9404 are ammonia, nitrous oxide, and nitrogen. Major aqueous products are sodium formate, acetate, nitrate, and nitrite, but not all carbon products have been identified. Hydrothermal processing of base hydrolysate destroyed up to 98% of the organic carbon in solution, and higher destruction efficiencies are possible. Major gas products detected from hydrothermal processing were nitrogen and nitrous oxide.

16462 (LA-UR–95-1107) **Technology assessment of RDX production.** Coburn, M.D. (New Mexico Inst. of Mining and Technology, Socorro, NM (United States)). Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941255–2: Life cycles of energetic materials, Del Mar, CA (United States), 11-16 Dec 1994). Order Number DE95009487. Source: OSTI; NTIS; GPO Dep.

The known processes for producing RDX were assessed with the goal of identifying the process that would generate the least waste and pollution. It was concluded that the Bachman process employed at Holston AAP is the most economical process for producing RDX and that it probably produces less waste than any other process. It was generally agreed that the entire Holston operation is a very clean one that complies with all federal and state emission standards. In addition, a number of opportunities in which Holston could reduce their wastes were identified. Preliminary assessments of waste and pollution profiles for alternate materials, with emphasis on dual-use materials, were performed.

16463 Synthesis of 3,3-dinitroazetidine. Hiskey, M.A. To Dept. of Energy. 1993. Filed date 29 Mar 1993. U.S. Patent Application 8-037,873. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009985. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The compound, 3,3-dinitroazetidine, and a process of preparing 3,3-dinitroazetidine including reacting a mixture of 1-tertiary-butyl-3,3-dinitroazetidine and benzyl chloroformate to form 1-(benzyloxycarbonyl)-3,3dinitroazetidine, reacting the 1-(benzyloxycarbonyl)-3,3dinitroazetidine and trifluoromethanesulfonic acid to form 3,3-dinitroazetidinium trifluoromethanesulfonate, and neutralizing the 3,3-dinitroazetidinium trifluoromethanesulfonate with a base to form 3,3dinitroazetidine are provided. Salts of the 3,3dinitroazetidine and preparation of such salts are also disclosed.

16464 (SAND–95-0311) **On the feasibility of using smoothed particle hydrodynamics for underwater explosion calculations.** Swegle, J.W.; Attaway, S.W. Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95008799. Source: OSTI; NTIS; GPO Dep.

SPH (Smoothed Particle Hydrodynamics) is a gridless Lagrangian technique which is appealing as a possible alternative to numerical techniques currently used to analyze high deformation impulsive loading events. In the present study, the SPH algorithm has been subjected to detailed testing and analysis to determine the feasibility of using PRONTO/SPH for the analysis of various types of underwater explosion problems involving fluid-structure and shock-structure interactions. Of particular interest are effects of bubble formation and collapse and the permanent deformation of thin walled structures due to these loadings. These are exceptionally difficult problems to model. Past attempts with various types of codes have not been satisfactory. Coupling SPH into the finite element code PRONTO represents a new approach to the problem. Results show that the method is well-suited for transmission of loads from underwater explosions to nearby structures, but the calculation of late time effects due to acceleration of gravity and bubble buoyancy will require additional development, and possibly coupling with implicit or incompressible methods.

16465 (UCRL-ID–119432) **Empirical validation of the conceptual design of the LLNL 60-kg contained-firing facility.** Pastrnak, J.W.; Baker, C.F.; Simmons, L.F. Lawrence Livermore National Lab., CA (United States). 24 Feb 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009459. Source: OSTI; NTIS; GPO Dep.

In anticipation of increasingly stringent environmental regulations, Lawrence Livermore National Laboratory (LLNL) is proposing to modify an existing facility to add a 60-kg firing chamber and related support areas. This modification will provide blast-effects containment for most of its open-air, high-explosive, firing operations. Even though these operations are within current environmental limits, containment of the blast effects and hazardous debris will further drastically reduce emissions to the environment and minimize the hazardous waste generated. The major design consideration of such a chamber is its overall structural dynamic response in terms of its long-term ability to contain all blast effects from repeated internal detonations of high explosives. Another concern is how much other portions of the facility outside the firing chamber must be hardened to ensure personnel protection in the event of an accidental detonation while the chamber door is open. To assess these concerns, a 1/4-scale replica model of the planned contained firing chamber was engineered, constructed, and tested with scaled explosive charges ranging from 25 to 125% of the operational explosives limit of 60 kg. From 16 detonations of high explosives, 880 resulting strains, blast pressures, and temperatures within the model were measured to provide information for the final design.

16466 (UCRL-JC–117774) **Measurements of a 1/4-scale model of a 60-kg explosives firing chamber.** Pastrnak, J.W.; Baker, C.F.; Simmons, L.F. Lawrence Livermore National Lab., CA (United States). 27 Jan 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9506168–1: EUROPYRO '95, Tours (France), 5-9 Jun 1995). Order Number DE95009476. Source: OSTI; NTIS; GPO Dep.

In anticipation of increasingly stringent environmental regulations, Lawrence Livermore National Laboratory (LLNL) proposes to construct a 60-kg firing chamber to provide blast-effects containment for, most of its open-air, high-explosive, firing operations. Even though these operations are within current environmental limits, containment of the blast effects and hazardous debris will further drastically reduce emissions to the environment and minimize the generated hazardous waste. The major design consideration of such a chamber is its overall structural dynamic response in terms of long-term containment of all blast effects from repeated internal detonations of high explosives. Another concern is how much other portions of the facility must be hardened to ensure personnel protection in the event of an accidental detonation. To assess these concerns, a 1/4-scale replica model of the planned contained firing chamber was designed, constructed, and tested with scaled explosive charges ranging from 25 to 125% of the operational explosives limit of 60 kg. From 16 detonations of high explosives, 880 resulting strains, blast pressures, and temperatures within the model were measured. Factors of safety for dynamic yield of the firing chamber structure were calculated and compared to the design criterion of totally elastic response. The rectangular, reinforced-concrete chamber model exhibited a lightly damped vibrational response that placed the structure in alternating cycles of tension and compression. During compression, both the reinforcing steel and the concrete remained elastic. During tension, the reinforcing steel remained elastic, but the concrete elastic limit was exceeded in two areas, the center spans of the ceiling and the north wall, where elastic safety factors as low as 0.66 were obtained, thus indicating that the concrete would be expected to crack in those areas. Indeed, visual post-test inspection of those areas revealed tight cracks in the concrete.

16467 (UCRL-JC–118313) **Measurements of a 1/4-scale model of an explosives firing chamber.** Pastrnak, J.W.; Baker, C.F.; Simmons, L.F. Lawrence Livermore National Lab., CA (United States). 27 Jan 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9504133–1: 7. international symposium on interactions of the effects of munitions with structures, Mannheim (Germany), 24-28 Apr 1995). Order Number DE95009478. Source: OSTI; NTIS; GPO Dep.

In anticipation of increasingly stringent environmental regulations, Lawrence Livermore National Laboratory (LLNL) proposes to construct a 60-kg firing chamber to provide blast-effects containment for most of its open-air, high-explosive, firing operations. Even though these operations are within current environmental limits, containment of the blast effects and hazardous debris will further drastically reduce emissions to the environment and minimize the generated hazardous waste. The major design consideration of such a chamber is its overall structural dynamic response in terms of long-term containment of all blast effects from repeated internal detonations of high explosives. Another concern is how much other portions of the facility outside the firing chamber must be hardened to ensure personnel protection in the event of an accidental detonation while the chamber door is open. To assess these concerns, a 1/4-scale replica model of the planned contained firing chamber was designed, constructed, and tested with scaled explosive charges ranging from 25 to 125% of the operational explosives limit of 60 kg. From 16 detonations of high explosives, 880 resulting strains, blast pressures, and temperatures within the model were measured to provide information for the final design. Factors of safety for dynamic yield of the firing chamber structure were calculated and compared to the design criterion of totally elastic response. The rectangular, reinforced-concrete chamber model exhibited a lightly damped vibrational response that placed the structure in alternating cycles of tension and compression. During compression, both the reinforcing steel and the concrete remained elastic.

16468 (UCRL-JC–118375) **Experiments and computer simulations of the dynamic cavity formed by a particulated shaped-charge jet in sand.** Simonson, S.C.; Winer, K.A.; Reaugh, J.E.; Breithaupt, R.D.; Baum, D.W. Lawrence Livermore National Lab., CA (United States). 28 Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950537–4: 15. international symposium on ballistics, Haifa (Israel), 21-24 May 1995). Order Number DE95009562. Source: OSTI; NTIS; GPO Dep.

Experiments have been carried out to measure the dynamic cavity growth of dry sand during penetration by particulated jets from Viper 65-mm-diameter, Cu-lined conical shaped charges at 1,000-mm standoff. The sand target was instrumented with foil switches, piezoelectric pins, and pressure transducers. Flash radiography at 450-keV was used to characterize the jets before impact and to image the target hole during jet penetration. The authors have developed a dry sand equation of state based on existing Hugoniot data as input to a porous material model incorporated in the 2-D arbitrary Lagrangian-Eulerian hydrocode CALE. They have carried out sand penetration simulations in which the particulated jet is modeled as hot copper rods. By varying parameters in the sand and copper descriptions they identify those features that affect the dynamic cavity formation.

16469 (UCRL-JC–118383) **High-speed, high-resolution observations of shaped-charge jets undergoing particulation.** Winer, K.; Breithaupt, D.; Shaw, L.; Muelder, S.; Baum, D. Lawrence Livermore National Lab., CA (United States). 28 Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950537–3: 15. international symposium on ballistics, Haifa (Israel), 21-24 May 1995). Order Number DE95009564. Source: OSTI; NTIS; GPO Dep.

Image-converter (IC) camera photography has provided spectacular images and quantitative records of liner collapse and early jet formation in shaped charges. We have extended the application of the IC camera to observations of shaped charge jet surfaces undergoing particulation. Sequential, high-resolution photographs were taken following the same 10-cm portion of jet at 2.5-μs intervals. Simultaneous color rotating-mirror framing camera photographs and 450-keV flash x-ray radiographs were also taken of the same region. This combination provides a detailed record of the evolution of surface structure during jet necking and particulation. In the high-resolution photographs, individual features on the jet surfaces as small as ~100 μm can easily be detected and followed as they evolve over time. The jet surface structure is rough with overlapping slip dislocation lines running along the surface at 45° to either side of the jet axis. This is similar to the texture that develops in long rods undergoing static tension. We discuss the implications of these images for increasing jet particulation times.

4502 Nuclear Explosions and Explosives

Refer also to citation(s) 15049, 16278, 16476, 16517, 16666

16470 (SAND–94-2294C) **Application of fuzzy technology to risk-based design and decision problems.** Senglaub, M.E. (Sandia National Labs., Albuquerque, NM (United States)); Bahill, A.T. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740–11: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95006815. Source: OSTI; NTIS; GPO Dep.

A study was undertaken to assess the impact of employing fuzzy technologies in areas of complex weapon system design. The technology was examined for use in a life-cycle cost exercise with the objective of providing a foundation from which to make service life assessments and recommendations on future weapon systems. The issues associated with this problem can be highly subjective and often exhibit a high degree of functional as well as variable uncertainty, ambiguity and noise. The study demonstrated that there is a potential role for the technology, but only in a hybridized environment not as a stand-alone solution methodology.

16471 (SAND–94-2514C) **The dynamic response of a weapon's internal components to a high speed impact.** Gruda, J.D. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740–10: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95006816. Source: OSTI; NTIS; GPO Dep.

The dynamic response of a weapon's internal components to an accident is critical in determining the safety of a weapon. The primary objective of this study was to determine the safety of the weapon based on the acceleration histories of its safety components. The accident scenario was a 80 feet/second impact of the weapon onto a railroad rail. Large deformations and many contacts were expected due to the severity of the impact condition. The complexity of this analysis required a nonlinear finite element code which could track many contact surfaces simultaneously and simulate material failure using element death. The damage to the structure and its contents was simulated using PRONTO3D (an explicit finite element code developed at Sandia National Laboratories). Some of PRONTO3D's advanced features used in the calculations included the self-contacting algorithms, material death, and rigid body mechanics. Throughout the analysis, a large number of mechanical contacts, both normal and sliding with friction, were detected and tracked by PRONT03D. The analysis predicted large deformations and material failure that took the form of tears in the aluminum shroud and in the housing of the components. The predicted acceleration histories were then used to determine if the components remained functional.

16472 (SAND–94-2891C) **Risk assessment methodologies for nuclear weapons compared to risk assessment methodologies for nuclear reactors.** Benjamin, A.S. (Sandia National Labs., Albuquerque, NM (United States). Special Risk Assessment Projects Dept.). Sandia National Labs.. Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740–13: Joint ASME/JSME pressure vessels and piping conference,

Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95007736. Source: OSTI; NTIS; GPO Dep.

There are major differences between the safety principles for nuclear weapons and for nuclear reactors. For example, a principal concern for nuclear weapons is to prevent electrical energy from reaching the nuclear package during accidents produced by crashes, fires, and other hazards, whereas the foremost concern for nuclear reactors is to maintain coolant around the core in the event of certain system failures. Not surprisingly, new methods have had to be developed to assess the risk from nuclear weapons. These include fault tree transformations that accommodate time dependencies, thermal and structural analysis techniques that are fast and unconditionally stable, and Monte-Carlo-based sampling methods that incorporate intelligent searching. This paper provides an overview of the new methods for nuclear weapons, compares them with existing methods for nuclear reactors, identifies some of their dual-use characteristics, and discusses ongoing developmental activities.

16473 (UCRL-ID–119429) **Executive summary of NWET applications for NIF workshop.** Simonson, G. (Lawrence Livermore National Lab., CA (United States)); Rosenkilde, C. (eds.); Beezhold, W.; Hebert, P.; Hoover, T.; Kennedy, T.; Knowles, C.; Simonson, G.; Tobin, M. Lawrence Livermore National Lab., CA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010409. Source: OSTI; NTIS; GPO Dep.

A workshop on nuclear weapon effects test (NWET) applications for the proposed National Ignition Facility (NIF) was convened on March 15, 1994 and continued through March 17, at the Lawrence Livermore National Laboratory, Livermore, California. After an introductory overview that discusses the National ICF Program, lessons learned from South Africa, and the NIF Proposal, this report describes: the various potential environments the NIF is expected to produce, spanning the full range of x-ray energies, plus neutrons, debris, and some mention of gammas; the potential needs for NWET as foreseen for the future, beyond the year 2000, including considerations of potential robust designs and hardness uncertainties; and options for the final facilitization of NIEF for NWET, outlining some of the practical issues that must be considered early in the design process, and showing the levels of capability that could be achieved corresponding to three plausible levels of investment specifically for NWET.

4503 Nuclear Explosion Detection

16474 (LA-UR–95-1072) **Space-based RF signal classification using adaptive wavelet features.** Caffrey, M.; Briles, S. Los Alamos National Lab., NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9504137–1: SPIE: aero sense conference, San Francisco, CA (United States), 17-21 Apr 1995). Order Number DE95009499. Source: OSTI; NTIS; GPO Dep.

RF signals are dispersed in frequency as they propagate through the ionosphere. For wide-band signals, this results in nonlinearly-chirped-frequency, transient signals in the VHF portion of the spectrum. This ionospheric dispersion provide a means of discriminating wide-band transients from other signals (e.g., continuous-wave carriers, burst communications, chirped-radar signals, etc.). The transient nature of these dispersed signals makes them candidates for wavelet feature selection. Rather than choosing a wavelet ad hoc, we adaptively compute an optimal mother wavelet via a neural network. Gaussian weighted, linear frequency modulate (GLFM) wavelets are linearly combined by the network to generate our application specific mother wavelet, which is optimized for its capacity to select features that discriminate between the dispersed signals and clutter (e.g., multiple continuous-wave carriers), not for its ability to represent the dispersed signal. The resulting mother wavelet is then used to extract features for a neutral network classifier. The performance of the adaptive wavelet classifier is the compared to an FFT based neural network classifier.

16475 (PNL-SA–25481) **Airborne radionuclides of concern and their measurement in monitoring a Comprehensive Test Ban Treaty.** Perkins, R.W.; Miley, H.S.; Hensley, W.K.; Abel, K.H. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950151–4: NATO (ASI)/monitoring a comprehensive test ban treaty, Algrave (Portugal), 23 Jan - 2 feb 1995). Order Number DE95007811. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) is conducting radioanalytical developmental programs with the goal of providing near-real-time analysis technology for airborne signature radionuclides which are indicative of a nuclear weapons test in any of the earth's environments. If a test were conducted in the atmosphere or above the atmosphere, then the full spectrum of fission and activation products, together with residues from the device would be dispersed in the atmosphere. However, if a nuclear test were conducted underground or under water, the emission could range from a major to a very minor vent, and the material released would likely consist mainly of noble gas radionuclides and the radioiodines. Since many of the noble gases decay to form particulate radionuclides, these may serve as the more sensitive signatures. For example, Ba-140 is a daughter of Xe-140 (13.6 s), and Cs-137 is a daughter of Xe-137 (3.82 min). Both of these have been observed in large amounts relative to other fission products in dynamic venting of U.S. underground nuclear detonations. Large amounts of radionuclides are produced from even a comparatively small nuclear detonation. For example, a 10-KT fission device will produce approximately a megacurie of Ba-140 and of several other radionuclides with half-lives of days to weeks. If such a device were detonated in the atmosphere at midlatitude, it would easily be observable at downwind monitoring sites during its first and subsequent circumnavigations of the earth. Efficient and practical methods for the near-real-time analysis of both particulate and gaseous radionuclides are important to an effective monitoring and attribution program in support of a Comprehensive Test Ban Treaty (CTBT); methods for this purpose are being pursued.

16476 (UCRL-JC–119102) **Differences in seismic decoupling with chemical and nuclear explosives.** Glenn, L.A. Lawrence Livermore National Lab., CA (United States). Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950182–2: 2. Defense Nuclear Agency/Arms Control and Disarmanent Agency (DNA/ACDA) veritech symposium, Washington, DC (United States), 10-12 Jan 1995). Order Number DE95009872. Source: OSTI; NTIS; GPO Dep.

An extensive series of simulations was performed of underground explosions in salt, using both chemical and nuclear explosives. In both cases, the radius of the initial emplacement cavity was varied from the fully tamped configuration to as large as 80 $m/kt^{1/3}$; when not fully tamped, the cavity was assumed initially to contain air at ambient temperature and pressure. In the nuclear source case, the simulations are shown to be in good agreement with the SALMON/STERLING events conducted by the U.S., and with recently released Russian data on a similar pair of explosions in an Azgir salt dome. Simulation of the U.S. COWBOY series of chemical explosions in a Louisiana salt mine are also shown to be in very good agreement with the experimental data, however the constitutive model for the salt that best explains these data is different from that derived for SALMON; both salt models are amply supported by laboratory and field data. The main result of these simulations is that cavity decoupling with chemical explosives is much less efficient than with nuclear explosives. Although maximum decoupling factors, f_{max}, near 200 may be attainable with either of the two sources, the cavity size required to achieve this value appears to be > 40 $m/kt^{1/3}$. For cavity radii half as large, f_{max} is roughly 4 times lower with nuclear explosives, and lower by another factor of 4 with chemical sources. Moreover, if the initial cavity radius is a more modest 10 $m/kt^{1/3}$, $f_{max} < 3$ even with a nuclear source.

16477 (UCRL-JC–119103) **KUCHEN: An experiment to evaluate decoupling in high-aspect-ratio cavities.** Glenn, L.A.; Heinle, R.A.; Moran, B.; Rambo, J.; Roth, B.G. Lawrence Livermore National Lab., CA (United States). Jan 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950182–1: 2. Defense Nuclear Agency/Arms

Control and Disarmanent Agency (DNA/ACDA) veritech symposium, Washington, DC (United States), 10-12 Jan 1995). Order Number DE95009873. Source: OSTI; NTIS; GPO Dep.

It has been argued that even if cavity-decoupled nuclear explosions are a theoretical evasion scenario, the size of the cavity required may be so large as to preclude their use, except possibly in salt. For example, to obtain a decoupling factor of 50 or more would require a cavity radius of at least 20 m/kt. Various theoretical studies have shown, however, that spherical cavities may not be necessary, and that ratios of length-to-span of 10-20 might be used without significant loss of decoupling capability so long as the volume is maintained. This means, for example, that if a tunnel with cylindrical cross section were employed to decouple a 1 kt explosion, the tunnel radius would decrease from 20 m to 8.1 m with an aspect (length-to-diameter) ratio of 10 and to 6.4 m with an aspect ratio of 20. At NTS, we intend to take advantage of the readiness effort activities and funding to perform mid-scale chemical-explosion decoupling experiments in an event called KUCHEN that is scheduled for the spring of 1995. We have identified an 8 ft-diameter hole, 3 50 ft deep in area 9 (U9cu) that is available for these experiments. Our plan is to conduct two tamped shots and at least one decoupling shot in this hole. The explosive charge will be on the order of 50 kg and the aspect ratio will be in the range 10-15. Details of the proposed experiments are discussed.

4505 Strategic Defense Initiative

16478 (SAND–95-0342) **Glass bead size and morphology characteristics in support of Crystal Mist field experiments.** Einfeld, W. (Sandia National Labs., Albuquerque, NM (United States). Environmental Characterization Dept.). Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009118. Source: OSTI; NTIS; GPO Dep.

One of the tasks of the Lethality Group within US Army Space and Strategic Defense Command (USASSDC) is the development of a capability to simulate various missile intercept scenarios using computer codes. Currently under development within USASSDC and its various contractor organizations is a group of codes collected under a master code called PEGEM for Post Event Ground Effects Model. Among the various components of the code are modules which are used to predict atmospheric dispersion and transport of particles or droplets following release at the altitude specified in the missile intercept scenario. The atmospheric transport code takes into account various source term data from the intercept such as: initial cloud size; droplet or particle size distribution; and, total mass of agent released. An ongoing USASSDC experimental program termed Crystal Mist involved release of precision glass beads under various altitude and meteorological conditions to assist in validation and refinement of various codes that are components of PEGEM used to predict particle atmospheric transport and diffusion following a missile intercept. Here, soda-lime glass beads used in the Crystal Mist series of atmospheric transport and diffusion tests were characterized by scanning electron microscopy and automated image processing routines in order to fully define their size distributions and morphology. Four bead size classifications ranging from a median count diameter of 45 to 200 micrometers were found to be approximately spherical and to fall within the supplier's sizing specifications. Log-normal functions fit to the measured size distributions resulted in geometric standard deviations ranging from 1.08 to 1.12, thereby fulfilling the field trial requirements for a relatively narrow bead size distribution.

4506 Chemical and Biological

16479 (UCRL-JC–118760) **The Cooperative On-site Sampling and Analysis Experiment (COSAX).** McGuire, R.R. (Lawrence Livermore National Lab., CA (United States). Arms Control and Treaty Verification Program); Trethewey, A.; Simak, R.S. Lawrence Livermore National Lab., CA (United States). Oct 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950163–3: 3. international on-site analysis conference, Houston, TX (United States), 22-25 Jan 1995). Order Number DE95009878. Source: OSTI; NTIS; GPO Dep.

The Chemical Weapons Convention (CWC) expresses a preference for the analysis of samples at the site of the inspection during which they were collected. In order to accomplish this effectively a highly portable laboratory kit must be assembled in modular form to be transported to the inspection site. This kit must allow for the collection of samples, the preparation of samples for analysis and, finally, the analysis of the collected samples. The US Army Research, Development and Engineering Center (ERDEC) and the Lawrence Livermore National Laboratory (LLNL) under US Department of Energy funding have, largely through independent but coordinated programs, assembled such a laboratory kit. ERDEC and LLNL have joined with the UK Chemical and Biological Defence Establishment (CBDE) to evaluate and demonstrate the capability of the portable laboratory kit. The exercise, called the Cooperative, On-site Sampling and Analysis Experiment (COSAX) took place from 11 to 15 April, 1994, at the CBDE, Porton Down, UK. The paper describes the experimental plan, discusses, the results, and summarizes the findings.

54 ENVIRONMENTAL SCIENCES

Refer also to citation(s) 15656

16480 (NEI-DK–1954) **National Environmental Research Institute R and D projects 1995.** Christensen, H. (ed.). Danmarks Miljoeundersoegelser, Roskilde (Denmark). Feb 1995. 136p. Order Number DE95772353. Source: OSTI; NTIS.

The publication provides detailed information on current research activities of The National Environmental Research Institute (NERI. Denmark). It supports NERI's policy of increased cooperation in this field of research. NERI's research and development projects are presented in the wider contexts of its current areas of research. Definitions and aims are given in a short introduction to each area. Project descriptions include the title of the project, the names of the project coordinator and other involved scientists and information on the amount of time spent on the project by personnel. Collaborating institutions are named as well as sponsoring agencies and foundations. Descriptions are also given of the general background, objectives and methods employed. Current subjects of research range under the headings of systems analysis, microbiology, ecotoxology, environmental and analytical chemistry, atmospheric research, arable land ecology, uncultivated areas and woodlands, streams and catchment areas, lake ecology, estuarine ecology, marine ecology, population ecology, transport and the environment and environmental data. Information is also given on the nature and organization of NERI. (AB)

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 14726, 14766, 15145, 15167, 15242, 15375, 15453, 15653, 15657, 15770, 15778, 15784, 15798, 15810, 16193, 16475, 16544, 16588, 16629, 16652, 16653, 16654, 16655, 16657, 16676, 16705, 17341

16481 (BARC–1994/E/021) **Studies on the diffusional and electrical transport of the daughter aerosols of radon and thoron in moving gases.** Mayya, Y.S. (Bhabha Atomic Research Centre, Bombay (India). Enviornmental Assessment Div.); Sahni, D.C. Bhabha Atomic Research Centre, Bombay (India). 1994. 200p. Order Number DE95627770. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents a detailed theoretical study of the transport characteristics of the daughter products of radon and thoron gases in channel flow devices. Specific aspects examined include: (i) development of the Green's function of the convective-diffusion operator and its boundary layer forms with and without axial diffusion, (ii) transport probabilities of recoil atoms (RaB) emitted into stagnant and moving gases, due to alpha decays of the parent atoms (RaA) deposited on surfaces, (iii) a comprehensive theory of double filter systems and (iv) microscopic theory of particle transport in

moving fluids based on the Fokker-Planck equation. Both uniform and parabolic velocity profiles are considered. Various applications of the solutions in interpreting the measured data are presented. Chief among them is the application of the advanced theory of double-filter systems employed in Trombay studies for the measurements of thoron in the exhaled breath of thorium workers. (author). 130 refs., 4 figs.

16482 (CONF-940277–) **Proceedings of the Fourth Atmospheric Radiation Measurement (ARM) Science Team Meeting.** USDOE Office of Energy Research, Washington, DC (United States). Environmental Sciences Div. Apr 1995. 373p. Sponsored by USDOE, Washington, DC (United States). From Atmospheric radiation measurement science team meeting; Charleston, SC (United States); 28 Feb - 3 mar 1994. Order Number DE95009951. Source: OSTI; NTIS; GPO Dep.

This document contains the summaries of papers presented at the 1994 Atmospheric Radiation Measurement (ARM) Science Team meeting held in Charleston, South Carolina. To put these papers in context, it is useful to consider the history and status of the ARM Program at the time of the meeting. The history of the project has several themes. First, the Program has from its very beginning attempted to respond to most critical scientific issues facing the United States Global Change Research Program. Second, the Program has been strongly coupled to other agency and international programs. The Program reflects an unprecedented collaboration among the various elements of the national research community, including a significant level of cooperation among the U.S. Department of Energy's (DOE) national laboratories. Next, ARM has always attempted to make the most judicious use of its resources by collaborating and leveraging existing assets and has managed to maintain an aggressive schedule despite budgets that have been much smaller than planned. Finally, the Program has attracted some of the very best scientific talent in the climate research community and has, as a result, been very productive scientifically. This introduction covers the first three points-the papers themselves speak to the last point. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

16483 (CONF-9410327–1) **Field performance of the Walker Branch throughfall displacement experiment.** Hanson, P.J. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.); Todd, D.E.; Edwards, N.T.; Huston, M.A. Oak Ridge National Lab., TN (United States). 6 Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium o ecosystem manipulation; Bowness-on-Windermere (United Kingdom); 19-21 Oct 1994. Order Number DE95008677. Source: OSTI; NTIS; GPO Dep.

The authors are conducting a large-scale manipulative field experiments in an upland oak forest on the Walker Branch Watershed in eastern Tennessee USA to identify important ecosystem responses that might result from future precipitation changes. The manipulation of soil moisture is being implemented by a gravity-driven transfer of throughfall precipitation from one treatment plot to another. Throughfall is intercepted in ≈ 2,000 subcanopy troughs (0.3 x 5 m) suspended above the forest floor of the dry plots (≈ 33% of the ground area is covered) and transferred by gravity flow across an ambient plot for subsequent distribution onto the wet treatment plot. Percent soil water is being monitored with time domain reflectometers at 310 sampling locations across the site. The experimental system is able to produce statistically significant differences in soil water content in years having both extremely dry and extremely wet conditions. Furthermore, comparisons of pre- and post-installation soil temperature measurements have documented the ability of the experimental design to produce these changes without changing the microclimate of the forest understory.

16484 (CONF-950646–1) **Particulate air pollution and increased mortality: Biological plausibility for causal relationship.** Henderson, R.F. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst. [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. From Air and Waste Management Association meeting; San Antonio, TX (United States); 18-23 Jun 1995. Order Number DE95006161. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, a number of epidemiological studies have concluded that ambient particulate exposure is associated with increased mortality and morbidity at PM concentrations well below those previously thought to affect human health. These studies have been conducted in several different geographical locations and have involved a range of populations. While the consistency of the findings and the presence of an apparent concentration response relationship provide a strong argument for causality, epidemiological studies can only conclude this based upon inference from statistical associations. The biological plausibility of a causal relationship between low concentrations of PM and daily mortality and morbidity rates is neither intuitively obvious nor expected based on past experimental studies on the toxicity of inhaled particles. Chronic toxicity from inhaled, poorly soluble particles has been observed based on the slow accumulation of large lung burdens of particles, not on small daily fluctuations in PM levels. Acute toxicity from inhaled particles is associated mainly with acidic particles and is observed at much higher concentrations than those observed in the epidemiology studies reporting an association between PM concentrations and morbidity/mortality. To approach the difficult problem of determining if the association between PM concentrations and daily morbidity and mortality is biologically plausible and causal, one must consider (1) the chemical and physical characteristics of the particles in the inhaled atmospheres, (2) the characteristics of the morbidity/mortality observed and the people who are affected, and (3) potential mechanisms that might link the two.

16485 (CONF-950646–5) **Management of meteorological data at a former nuclear weapons facility.** Dickerman, C.L.; Maxwell, D.R. EG and G Rocky Flats, Inc., Golden, CO (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. From Air and Waste Management Association meeting; San Antonio, TX (United States); 18-23 Jun 1995. Order Number DE95007619. Source: OSTI; NTIS; GPO Dep.

The purposes of the Climatological Data Management and Meteorological Monitoring programs at the Rocky Flats Environmental Technology Site (Site), are to support Emergency Response (ER) programs at the Site for use in assessing the transport, diffusion, and deposition of effluents actually or potentially released into the atmosphere by Site operations, to provide information for on-site and off-site projects concerned with the design of environmental monitoring networks for impact assessments, environmental surveillance activities, and remediation activities. Also, maintenance of a meteorological monitoring network, which includes measuring, archiving, analyzing, interpreting, and summarizing resulting data is required for successfully generating monthly and annual environmental monitoring reports and for providing assistance for on-site and off-site projects. Finally, the Meteorological Monitoring Program provides information for site-specific weather forecasting, which supports Site operations, employee safety, and Emergency Response operations.

16486 (CTH-PUBL–93-8, pp. 2-12) **CFC substitutes; Implications for ozone and climate.** Berntsen, T. (Univ. of Oslo (Norway). Inst. for Geophysics). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

Increased understanding of the physics and chemistry of the atmosphere has lead to strict regulations of the use of chlorofluorocarbons (CFCs). Observations have shown significant ozone depletions on regional and seasonal scales (i.e. the Antarctic ozone hole) which are shown to be caused by anthropogenic emissions of CFCs. Lesser, but still statistically significant, reductions have been observed over large parts of the Northern Hemisphere. The latest observational evidence of large scale ozone depletions are presented. The rapid phase-out of the fully halogenated CFCs inferred by the Montreal Protocol, has lead to increased concern about environmental impacts of intermediate CFC-substitutes like HCFC and HFCs. Tropospheric loadings of total organic chlorine and stratospheric loadings of active chlorine has been calculated by a simple model for different emission scenarios. Total active chlorine

levels in the lower stratosphere (from the substitutes) is shown to reach its maximum before year 2000 when an emission scenario according to the Montreal Protocol has been applied. The direct effect on climate has been estimated by calculating the increased radiative forcing due to the substitutes. 9 refs, 7 figs, 4 tabs

16487 (CTH-PUBL–93-8, pp. 13-17) **"PUR 2000" - Norwegian producers of rigid PUR foam unite in a national research programme in the further development of environmental friendly PUR technology.** Vik, B. (Norwegian Plastic Industry Federation (Norway). Rigid PUR foam group). Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Building Technology. [1993]. (CONF-9309477–: Nordic Seminar on CFC-free Insulation Techniques, Aarhus (Denmark), 6-7 Sep 1993). In *Proceedings of the Nordic Seminar on CFC-free Insulation Techniques.* 157p. Order Number DE95766686. Source: OSTI; NTIS.

Norwegian rigid PUR-foam industry has been CFC-free for more than 2 years. The most commonly used blowing agents to day belong to the HCFCs, which are to be phased out in course of few years. Through collaboration and common R and D-effort, Norwegian rigid PUR-foam industry has the ambitions to be amongst the environmental leading PUR-companies of the world, and to fulfill the phase out also of HCFCs ahead of UN- and EEC-regulations.

16488 (DEFU-TR–343) **CFC phase-out. Consequences for operation and energy consumption in cooling systems.** Borup Jensen, J.; Lundager, F.; Lykke Jensen, M. Danske Elvaerkers Forenings Udredningsafdeling (DEFU), Lyngby (Denmark); Danske Elvaerkers Forening, Copenhagen (Denmark). Dec 1994. 106p. (In Danish). Order Number DE95772414. Source: OSTI; NTIS.

Because of the threat to the ozone layer, the use of chlorofluorocarbon (CFC) refrigerants are to be gradually phased out during the coming years. Several ways of achieving this are described and this information should be of use to energy consultants, also in relation to energy conservation. A survey of environmental questions based on related international agreements is given. Since January 1st, 1995, it is forbidden to produce CFC refrigerants in Denmark. Thus the emphasis is on suggestions for alternative refrigerants (such as propane, ammonia, carbon dioxide, and butane) their potentials and the necessary changes in cooling system design. Energy, and environmental-related consequences and costs of using other refrigerants are described in addition to the possibilities of obtaining state subsidies in this relation. Concrete examples are given on how to change out cooling systems and/or refrigerants. (AB) (13 refs.)

16489 (DOE/ER/61761–1) **Feasibility of tropospheric water vapor profiling using infrared heterodyne differential absorption lidar.** Grund, C.J. (NOAA Environmental Technology Lab., Boulder, CO (United States)); Hardesty, R.M.; Rye, B.J. Colorado Univ., Boulder, CO (United States). Cooperative Inst. for Research in Environmental Sciences. 3 Apr 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI03-94ER61761. Order Number DE95009647. Source: OSTI; NTIS; GPO Dep.

Continuous, high quality profiles of water vapor, free of systematic bias, and of moderate temporal and spatial resolution, acquired over long periods at low operational and maintenance cost, are fundamental to the success of the ARM CART program. The development and verification of realistic climate model parameterizations for clouds and net radiation balance, and the correction of other CART site sensor observations for interferences due to the presence of water vapor are critically dependent on water vapor profile measurements. Application of profiles acquired with current techniques, have, to date, been limited by vertical resolution and uniqueness of solution [e.g. high resolution infrared (IR) Fourier transform radiometry], poor spatial and temporal coverage and high operating cost (e.g. radiosondes), or diminished daytime performance, lack of eye-safety, and high maintenance cost (e.g. Raman lidar). Recent developments in infrared laser and detector technology make possible compact IR differential absorption lidar (DIAL) systems at eye-safe wavelengths. In the study reported here, we develop DIAL system performance models and examine the potential of to solve some of the shortcomings of previous methods using parameterizations representative of current technologies. These models are also applied to diagnose and evaluate other strengths and weaknesses unique to the DIAL method for this application. This work is to continue in the direction of evaluating yet smaller and lower-cost laser diode-based systems for routine monitoring of the lower altitudes using photon counting detection methods. We regard the present report as interim in nature and will update and extend it as a final report at the end of the term of the contract.

16490 (DOE/NV/11432–173) **USDOE Nevada Operations Office Environmental Monitoring Program summary data report. Third calendar quarter 1994.** Black, S.C.; Glines, W.M.; Townsend, Y.E. (eds.). Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Jan 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95010670. Source: OSTI; NTIS; INIS; GPO Dep.

The radiological environmental surveillance (air, surface water, supply well water, drinking water) and nonradiological effluent monitoring (drinking water, sewage lagoons, nonhazardous solid waste disposal) activities are reported for Nevada, Nevada Test Site (NTS), Pantex, and fissile nuclear materials storage/disposition. NEPA documentation and environmental occurrences at NTS facilities are listed.

16491 (ETDE-DE–66) **N_2O-emissions from fluidized bed combustion. Investigations about reactions paths and options of minimization. Final report.** Sybon, G.; Leuckel, W. Karlsruhe Univ. (T.H.) (Germany). Engler-Bunte-Institut Bereich 3 - Feuerungstechnik. Aug 1993. 73p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326730A. Order Number DE95768719. Source: OSTI; NTIS (US Sales Only).

A measurement technique using the principle of Fourier transformed infrared was adapted and used for the qualitative and quantitative measuring of N_2O. Investigations about the homogeneous system of FBC have been performed at an existing semi-technical rig and at an laboratory rig, which was built during the project. The influence of technical ashes was also investigated in the laboratory scaled rig. The dependences of the homogeneous N_2O-formation on temperature and stoichiometry have been pointed out; N_2O-formation increases with decreasing temperature and increasing oxygen concentration. The reaction paths of the N_2O-Formation have been valuated. At fuel-lean conditions formation of N_2O is caused by CN-fuel-N-compounds; at fuel-rich conditions the importance of the reaction path via NH-radicals increases. N_2O-destruction is increased with enhanced temperature; the presence of reducing gas species as CO or H_2 enhances this effect. (orig.)

16492 (ETDE-DE–68) **Current emission ratings of furnaces subject to the Clean Air Technical Code in Baden Wuerttemberg.** Landesanstalt fuer Umweltschutz Baden-Wuerttemberg, Karlsruhe (Germany). Aug 1994. 35p. (In German). Order Number DE95768859. Source: OSTI; NTIS (US Sales Only).

The report lists the emissions of furnaces in Baden-Wurttemberg fuelled with heating oil, natural gas and wood. The pollutants CO, SO2, NOx and dust were measured.

16493 (ETDE-DE–69) **NO_x and dioxin abatement by SCR catalysts.** Huettenhofer, K.; Sigling, R.; Spitznagel, G.W. Siemens AG Unternehmensbereich KWU, Erlangen (Germany). Bereich Energieerzeugung. [1994]. 35p. Order Number DE95768733. Source: OSTI; NTIS (US Sales Only).

The report discusses the applications of the process of selective catalytic reduction in off-gas purification for reduction of nitrogen oxides and dioxins/furans. Two different types of catalyst (plates, honeycomb catalysts) and their applications are presented and compared. (SR)

16494 (ETDE-DE–80) **The land-surface climate program. Final report.** Roth, R.; Hoppmann, U. Hannover Univ. (Germany). Inst. fuer Meteorologie und Klimatologie. Dec 1994. 65p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 07KF114. Order Number DE95768531. Source: OSTI; NTIS (US Sales Only).

In the course of LOTREX-10E (longitudinal land-surface traverse experiment 10 E) several experiments along 10 East were planned

in order to obtain sets of climate related surface paramters at different latitudes. The results should be representative for areas in the scale of satellite-pixels or the grid-scale of climate models, respectively. One intention was the validation of satellite data for climate observation, another one the check and correction of actual climate models. For this purpose two interdisciplinary field experiments HIBE'88 and HIBE'89 (Hildesheimer Boerde Experiment) were conducted 1988 and 1989 in Northern Germany near Hannover. In the second part of this paper the principal objective of the experiments and the aims of the participants are presented. (orig.)

16495 (ETDE-DE–89) **Investigation of the stratospheric ozone variation especially in polar regions with a new laser system. Interim report.** Augstein, E. Alfred-Wegener-Institut fuer Polar- und Meeresforschung, Bremerhaven (Germany). 20 May 1988. 8p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT POL0033. Order Number DE95770381. Source: OSTI; NTIS (US Sales Only).

This research project aims at 1. developing and testing a XeCl Eximer laser for the determination of the vertical distribution of the atmospheric ozone concentration by day and at night, 2. recording the variations in space and time of vertical ozone profiles above all in the polar regions. To attain these aims a laser system has been developed which receives also in case of insolation an evaluable stray light signal from which the ozone concentration can be derived. The XeCl laser which is installed in a transportable container was successfully used in May and June 1987 on the FS 'Polarstern' in the Norwegian and Groenland sea. (orig.)

16496 (INIS-BR–3478) **Environmental dosimetry of radon-222 and daughters: measurement of absolute calibration factors of CR-39 considering the plate-out effects and environmental factors.** Paulo, S.R. de. Universidade Estadual de Campinas, SP (Brazil). Inst. de Fisica. Aug 1991. 369p. (In Portuguese). Order Number DE95626550. Source: OSTI; NTIS (US Sales Only); INIS.

The subject of this work concerns with the measurement of absolute calibration factors for the use of CR-39 as an absolute detector in indoor and daughters monitoring. Up to now the usefulness of calibration factors was restricted to environmental conditions equal (or very close) to those worthing during their determinations. This fact is consequence of the difficulties related to the understanding of the plate-out properties of radon daughters activity in the air. The plate-out effects on radon daughters monitoring performed by SSNTDs are studied. Our experimental results are in agreement with those of other authors about the great sensitivity of CR-39 to the plate-out effects, fact that recommended its use in this work. Being succeeded in the employment of CR-39 as an alpha-spectrometer we concluded that some important information (like the radon daughters deposition rates on the walls of an environment) can be achieved. The knowledge about the behavior of plate-out made possible the determination of the ranges in zenithal angle and energy where CR-39 can detect alpha-particles with efficiency of 100%, at our conditions of track observation. In this way, we obtained calibration factors for CR-39 that are weakly dependent on environmental conditions. We think that these results can contribute to the improvement of RD (Radiation Detector) detection techniques. (author). 159 refs, 106 figs, 05 tabs.

16497 (INIS-mf–14489) **Ecological aspects of energy efficiency.** Dichev, I.; Shvabski, Kh. National Electricity Co., Sofia (Bulgaria). 1994. 5p. (In Bulgarian). (CONF-9406318–: Energy forum '94 on the energy problems of Bulgaria, Varna (Bulgaria), 15-17 Jun 1994). Order Number DE95626675. Source: OSTI; NTIS (US Sales Only); INIS.

An attempt is made to give a quantitative expression of the link between energy efficiency and emissions of atmospheric pollutants. The authors investigate the specific emissions per 1 kWh of SO_2, NO_x, dust and CO_2 produced from different energy sources in 1993 in Bulgaria - TPP (black and brown coal, lignite), HPP and NPP. The emissions are considered as generalized ecological characteristics allowing to make quantitative comparison of different energy sources and to determine the ways of reducing particular absolute emission. As an example for application of this approach the following measures are proposed for reducing SO_2 emissions: (1) cutting the lignite-fired energy production; (2) increase of high-grade-coal-fired energy production; (3) increase of share of HPP and NPP in energy production; (4) increase in efficiency of energy usage by energy saving. The realization of these ways requires large investments in the industry as a whole. 1 tab., 2 figs. (orig.).

16498 (IVL-B–1180) **Validation of an ISO Standard Procedure for determination of SO_2 in flue gases.** Cooper, D. Swedish Environmental Research Inst., Goeteborg (Sweden). Mar 1995. 45p. (In Swedish). Order Number DE95766671. Source: OSTI; NTIS.

A manual reference method for determination of the concentration of SO_2 in emissions is needed parallel to the continuous methods. All available standard procedures build on a superseded method for analysis (the Thorin method). Ion chromatography has become a common method for sulfate analyses in spite of the fact that a formal standard procedure does not exist. SIS has proposed a new program of work for replacing the Thorin method with ion chromatography for a new ISO standard. To that end a project has been started to investigate the performance of the suggested method. Round Robin tests at 15 European laboratories are reported in the present publication. The results show that ion chromatography can replace the Thorin method. A proposal for a new standard document is included. 12 refs, 6 figs, 2 tabs

16499 (IVL-B–1183) **Clover as a bio indicator for ambient ozone in Sweden - a national cooperation project.** Pihl Karlsson, G. (Swedish Environmental Research Inst., Goeteborg (Sweden)); Pleijel, H.; Danielsson, H.; Skaerby, L.; Ericson, L. Swedish Environmental Research Inst., Goeteborg (Sweden). Mar 1995. 33p. (In Swedish). Order Number DE95766672. Source: OSTI; NTIS.

The study was performed in parallel to an international study by UNECE, ICP-Crops.The goal was to find out if the bio-indicator Subterranean Clover (Trifolium Subterraneum) could be cultivated all over Sweden, and to what extent ambient ozone affects this species in Sweden. Results show that Sub. Clover can be cultivated, that the critical concentrations are around 20 ppb for 24 hour exposure and 25 ppb for a 7 hour exposure. Injury potential of 10% arrives at a 24 hour exposure of 25 ppb and a 7 hour exposure of 30 ppb. 8 refs, 22 figs, 9 tabs

16500 (LA–12895-MS) **Chemical and isotopic variations of precipitation in the Los Alamos Region, New Mexico.** Adams, A.I.; Goff, F.; Counce, D. Los Alamos National Lab., NM (United States). Feb 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95008110. Source: OSTI; NTIS; INIS; GPO Dep.

Precipitation collectors were installed at 14 locations on the Pajarito Plateau and surrounding areas to study variations in chemistry, stable isotopes and tritium for the years 1990 to 1993. The volume of precipitation was measured and samples were collected and analyzed every three to four months. All precipitation samples contain <2.50 mg/kg Cl and have pH values ranging from 5.4 to 6.7. The stable isotope ($\delta D/\delta^{18}O$) results record seasonal variations in precipitation as the weather patterns shift from sources in the Pacific Ocean to sources in the Gulf of Mexico. The stable isotope results also show isotopic variations due to elevation differences among the collection points. The tritium contents (^3H) in rain samples vary from 6.54 T.U. to 141 T.U. Contouring of high tritium values (e.g. >20 T.U.) from each collection period clearly shows that Laboratory activities release some tritium to the atmosphere. The effect of these releases are well below the limits set by the Environmental Protection Agency for drinking water (about 6200 T.U.). The magnitude of the releases is apparently greatest during the summer months. However, anomalous tritium values are detected as far north as Espahola, New Mexico for many collection periods. Tritium releases by the Laboratory are not constant; thus, the actual amount of tritium in each release has been diluted in the composite samples of our three to four month collection periods.

16501 (NEI-DK–1880) **Air quality in the streets of Denmark. Calculations related to 34 streets.** Vejplanomraadet, Trafiksikkerhed og Miljoe, 14. Bendtsen, H.; Basse Kristensen, E.; Reiff, L. Vejdirektoraet, Copenhgaen (Denmark). 1994. 91p. (In Danish). Order Number DE95766510. Source: OSTI; NTIS.

A system is proposed for monitoring the air quality in the streets of Danish towns. It is based on calculations specified in the document 'Beregningsmodel for Luftforurening i Bygader' (VTI og Trivector, October 1992) - a model common to the Nordic countries - for the air quality in 34 urban streets in 8 urban areas. The monitoring system is tested on traffic data from the period 1985-1992. Calculations show a drop in levels of CO in all streets (with a more significant decrease on roads and thoroughfares) and a smaller drop in the occurrence of NO_2. One reason for this reduction is reckoned to be a improved engine technology and the introduction of catalytic converters on new cars at the end of the period. On approach roads and thoroughfares traffic has increased, in main streets and urban areas it has remained the same and it is reduced in main streets in central areas. It is recommended that in the streets selected a count should be carried out annually, the proportion of heavy traffic and speed measurements should be registered, a continuous evaluation should be made as to whether patterns of traffic growth on these streets are typical of Danish urban areas and the calculation model should be regularly updated. (AB) (13 refs.)

16502 (NEI-DK–1968) **Environmental Indicators 1994.** Wichmann, H. (ed.) (Skov- og Naturstyrelsen (Denmark)). Miljoe- og Energiministeriet, Copenhagen (Denmark). 1994. 39p. (In Danish). Order Number DE95772393. Source: OSTI; NTIS.

The aim of the report is to make it possible for the individual reader to get an overall picture of the present state of the Danish countryside and of the environment in general. Currently, lead emission has been reduced to almost zero, and the re-use of glass, paper and cardboard is regularly increasing, concentrations of ozone-layer depleting substances and sulphur dioxide emission decreases constantly and the harm previously suffered by some bird species is no longer prevalent. Continuing problems are water pollution (especially by nitrogen and chemicals used in agriculture), the threat to Danish groundwaters, and the fact that there a fewer and fewer birds that frequent arable lands. Danish forests are the main theme of the report. Forests give character to the Danish landscape and the government wishes to extend the forest areas. They are important as public recreation areas and for animal and plant life, Christmas trees can be grown in them, they are a part of the country's cultural history. It is important to make use of the forests, it is stated. Data and other information is also given on urban areas and on air, land and water pollution in Denmark. (AB)

16503 (NIRS-M–98, pp. 1-6) **Current status SPEEDI operation and its tasks.** Fukuyama, Shigeru (Nuclear Safety Technology Center, Tokyo (Japan).). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). (CONF-9312105–: 21. National Institute of Radiological Sciences, Chiba (Japan), 2-3 Dec 1993). In *Dose assessment and approach to the safety for the public in the emergency. Proceedings.* 210p. Order Number DE95747912. Source: OSTI; NTIS; INIS.

The System for Prediction of Environmental Emergency Dose Information called 'SPEEDI' provides realistic estimate of radiation concentration and dose assessment that may result from an atmospheric release of radioactive materials. SPEEDI uses advanced computer-based data processing and data communication system for atmospheric dispersion calculation to derive radiation consequence assessment with the concerned meteorological data and the source term information. SPEEDI has been developed since 1980 by Japan Atomic Energy Research Institute(JAERI), Meteorological Research Institute following to the lessons learned from the accident in 1979 at Three Mile Island, USA. Nuclear Safety Technology Center(NUSTEC) has been constructing a nationwide data communication network that links STA and relevant local governments since 1986. The network now comprises 13 local stations in local governments while the Science and Technology Agency(STA) functions as the command center for SPEEDI in case of emergency. In Japan, the conventional simplified Gaussian plume model has been used for emergency radiation dose estimation however, SPEEDI was recognized as the authorized method for it in Emergency Environmental Radiation Monitoring Criteria and Off-site Emergency Planning and Preparedness for Nuclear Power Plants' in 1992. The role of SPEEDI is now far the more important. Local governments are now conducting nuclear emergency exercises almost every year incorporating the information of SPEEDI in their scenarios. (author).

16504 (NIRS-M–98, pp. 7-16) **Development of 'health and environmental safety assessment network system (HESANS)'.** Nakamura, Yuji (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). (CONF-9312105–: 21. National Institute of Radiological Sciences, Chiba (Japan), 2-3 Dec 1993). In *Dose assessment and approach to the safety for the public in the emergency. Proceedings.* 210p. Order Number DE95747912. Source: OSTI; NTIS; INIS.

With the recent advance of the utilization of nuclear energy in a large scale, social interest is being focussed in the potential risk which the nuclear technology will accompany. Especially after the accidents in Chernobyl and other nuclear facilities, serious anxiety to the utilization of nuclear energy is prevailing among the general public. In order to meet the anxiety and distrust of the population in the use of the nuclear power, the health effect or risk which radioactive materials released into the environment will bring about should be comprehensively and properly evaluated, and then should be widely reported to the population. The development of HESANS code system (Health and Environmental Safety Assessment Network System) was planned to set up such a comprehensive computer code that covers a whole pathway of radioactive material from its release to estimates of derived health effects in the population, including the countermeasures for intervention as well. Though the whole system is not totally completed yet so far, the framework of the system has been concreted together with many sub-systems which compose the main part of the code. This report puts main stress on the objective of the development project and the main frame or the structure of the code system. (author).

16505 (NIRS-R–25, pp. 35-39) **Transfer of environmental tritium into organically bound form in foodstuffs and plant.** Inoue, Yoshikazu (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Miyamoto, Kiriko; Iwakura, Tetsuo. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

From the significance, with respect to dose, of organically bound tritium (OBT) in diet, transfer of environmental tritium into OBT was investigated by evaluating a specific activity ratio (SAR) of OBT to that of tissue free water tritium (TFWT) for environmental samples. The mean values of SAR of Japanese rice and Chinese rice observed 0.8 and 0.6, respectively suggested that the specific activity of OBT became less than unity due to the isotope discrimination in the assimilation process under the steady state condition. The SAR of about unity was also demonstrated for various kinds of worldwide foodstuffs. The extremely high SAR values reported by Italian researcher are therefore discounted. The SAR of about two observed in pine needles near tritium emitting facilities suggests a longer residence time of OBT than that of TFWT in plants causes the SAR over unity during a later period after a tritium discharge. The SAR value less than 0.4 observed in market foods near facilities suggests that atmospheric HTO vapor affects both TFWT and exchangeable OBT and causes the SAR less than about 0.4 during a short period after a tritium discharge. These phenomena should be taken into account to evaluate a variation of SAR under the non-steady state condition. The direct OBT formation in plant by elemental tritium was disregarded by a T_2 gas release experiment in Canada. (author).

16506 (NREL/SP–420-6365) **BioFacts: Fueling a stronger economy, Global warming and biofuels emissions.** National Renewable Energy Lab., Golden, CO (United States). Dec 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94006864. Source: OSTI; NTIS; GPO Dep.

The focus of numerous federal and state regulations being proposed and approved today is the reduction of automobile emissions – particularly carbon dioxide (CO_2), which is the greenhouse

gas considered responsible for global warming. Studies conducted by the USDOE through the National Renewable Energy Laboratory (NREL) indicate that the production and use of biofuels such as biodiesel, ethanol, and methanol could nearly eliminate the contribution of net CO_2 from automobiles. This fact sheet provides and overview of global warming, followed by a summary of NREL's study results.

16507 (SAND–95-0273) **Winter season air pollution in El Paso-Ciudad Juarez. A review of air pollution studies in an international airshed.** Einfeld, W.; Church, H.W. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 166p. Sponsored by USDOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009083. Source: OSTI; NTIS; GPO Dep.

This report summarizes a number of research efforts completed over the past 20 years in the El Paso del Norte region to characterize pollution sources and air quality trends. The El Paso del Norte region encompasses the cities of El Paso, Texas and Ciudad Juarez, Chihuahua and is representative of many US-Mexico border communities that are facing important air quality issues as population growth and industrialization of Mexican border communities continue. Special attention is given to a group of studies carried out under special US Congressional funding and administered by the US Environmental Protection Agency. Many of these studies were fielded within the last several years to develop a better understanding of air pollution sources and trends in this typical border community. Summary findings from a wide range of studies dealing with such issues as the temporal and spatial distribution of pollutants and pollution potential from both stationary and mobile sources in both cities are presented. Particular emphasis is given to a recent study in El Paso-Ciudad Juarez that focussed on winter season PM_{10} pollution in El Paso-Ciudad Juarez. Preliminary estimates from this short-term study reveal that biomass combustion products and crustal material are significant components of winter season PM_{10} in this international border community.

16508 (SAND–95-0571C) **Preliminary design for Arctic atmospheric radiative transfer experiments.** Zak, B.D. (Sandia National Labs., Albuquerque, NM (United States)); Church, H.W.; Stamnes, K.; Shaw, G.; Filyushkin, V.; Jin, Z.; Ellingson, R.G.; Tsay, S.C. Sandia National Labs., Albuquerque, NM (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950153–3: 4. conference on polar meteorology and oceanography, Dallas, TX (United States), 15-20 Jan 1995). Order Number DE95009580. Source: OSTI; NTIS; GPO Dep.

If current plans are realized, within the next few years, an extraordinary set of coordinated research efforts focusing on energy flows in the Arctic will be implemented. All are motivated by the prospect of global climate change. SHEBA (Surface Energy Budget of the Arctic Ocean), led by the National Science Foundation (NSF) and the Office of Naval Research (ONR), involves instrumenting an ice camp in the perennial Arctic ice pack, and taking data for 12–18 months. The ARM (Atmospheric Radiation Measurement) North Slope of Alaska and Adjacent Arctic Ocean (NSA/AAO) Cloud and Radiation Testbed (CART) focuses on atmospheric radiative transport, especially in the presence of clouds. The NSA/AAO CART involves instrumenting a sizeable area on the North Slope of Alaska and adjacent waters in the vicinity of Barrow, and acquiring data over a period of about 10 years. FIRE (First ISCCP [International Satellite Cloud Climatology Program] Regional Experiment) Phase 3 is a program led by the National Aeronautics and Space Administration (NASA) which focuses on Arctic clouds, and which is coordinated with SHEBA and ARM. FIRE has historically emphasized data from airborne and satellite platforms. All three program anticipate initiating Arctic data acquisition during spring, 1997. In light of his historic opportunity, the authors discuss a strawman atmospheric radiative transfer experimental plan that identifies which features of the radiative transport models they think should be tested, what experimental data are required for each type of test, the platforms and instrumentation necessary to acquire those data, and in general terms, how the experiments could be conducted. Aspects of the plan are applicable to all three programs.

16509 (SH-Beretning–61) **Smoke cleaning in small straw boilers. Venturi scrubber.** Kristensen, J.K. (Statens Husdyrbrugsforsoeg, Afd. for Bygningsteknik (Denmark)); Keller, P.; Germann, L. Statens Husdyrbrugsforsoeg, Horsens (Denmark). Afd. for Jordbrugsteknik. 1995. 66p. (In Danish). Contract ENS-51161-92.0094. Order Number DE95766517. Source: OSTI; NTIS.

In 1993-94 the National Institute of Agricultural engineering (SjF, Denmark) developed a scrubber which worked on the Venturi principle. Dust emission reductions of 85-90% could be achieved in an automatically charged straw boiler. Water is added, while the velocity of flue gas inside the scrubber increases to 50-90 m/s. At a fan pressure of 7.5 kPa and a dust content of 600 mg/m^3_n in the smoke an efficiency of 70% can be achieved. For a smoke quantity of 250 m^3/h, which is equivalent to a charged effect of 100 kW, it has not been possible to find a fan with an efficiency higher than about 25% at a pressure of 7.5 kPa. The power requirement of the scrubber is 2.3 kW. Standard fans have efficiencies higher than 50% and air flows that make the fans suitable for boilers of 400-800 kW, in large boilers the relative power requirement for the scrubbers can be reduced to half. Scrubbers discharge 2 l of drainage water pr. hr. hour which can profitably be conducted to a slurry tank or a cesspool. Corrosion by scrubbing water has been demonstrated around the weldings of the acid-resistant steel sheet. During operation the water in the scrubber is heated to about 55 deg. C. The heating energy generated can be exploited by using a heat exchanger, e.g. for underfloor heating etc. Scrubbers require a supply of 11 l of mains water per running hour. The efficiency of the boiler while cleaning the flue gas can be raised from 80 to more than 90%. Maintenance needs are limited. (AB)(812 refs.)

16510 (SNV–4231) **Regional formation of oxidants. Caused by emissions from wood firing.** Andersson-Skoeld, Y. (Swedish Environmental Research Inst., Stockholm (Sweden)). Swedish Environmental Protection Agency, Solna (Sweden). Sep 1993. 28p. (In Swedish). Order Number DE95766689. Source: OSTI; NTIS; INIS.

An atmospheric trajectory model has been used in case studies to calculate the regional ozone formation due to emissions from household wood burning in Sweden. The simulations are conducted in various types of environments and describe a number of different meteorological conditions. The case studies show that the ozone contribution from wood burning is low. The formation of PAN and aldehydes is more pronounced. The concentration of PAN in Sweden is, however, expected to be far below the levels affecting health and environment as are the concentrations of aldehydes. 25 refs, 7 tabs

16511 (STUK-A–119) **Indoor radon measurements and radon prognosis for eastern Uusimaa. Askola, Lapinjaervi, Lillendal, Lovlisa, Myrskylae, Maentsaelae, Maentsaelae, Pernaja, Pornainen, Porvoo, Porvoon mlk, Pukkila, Ruotsinpyhtaeae and Sipoo.** Voutilainen, A.; Maekelaeinen, I. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Feb 1995. 64p. (In Finnish). Order Number DE95628662. Source: OSTI; NTIS; INIS.

The purpose of the regional radon prognosis is to classify areas with different levels of radon risk. The radon prognosis gives the percentages of future homes expected to have indoor radon concentrations exceeding the levels of 200 and 400 Bq/m^3. It is assumed that no protection against the entry of radon is used in construction. In the study about 2400 indoor radon measurements made in single family houses, semi-detached houses and row houses were used. Data on the location, geology and construction of buildings were determined form maps and questionnaires. An empirical statistical model, the adjusted indoor radon measurement and geological data were used to assess the radon risk form soil and bedrock in different areas. (15 refs., 19 figs., 9 tabs.).

16512 (SVF–531) **Iron sulphate as a reducing agent in converting NO_2 to NO in connection with NO_x measurements of flue gas.** Henriksson, M. (Vattenfall Utveckling AB, Vaellingby (Sweden)); Axelsson, H.; Baeckstroem, S.; Ljungstroem, E. Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 70p. (In Swedish). Project Vaermeforsk-U3-405. Order Number DE95766639. Source: OSTI; NTIS.

Figures and tables with text in English.

The aim of this project has been to evaluate the possibility to use iron(II)sulphate as a reducing agent in converting NO_2 to NO in connection with NO_x-measurements of flue gas. The basis of this work is the need of measurement techniques of NO_x ($NO+NO_2$) in flue gas, when charging emission fees. This report includes the entire project. The conversion efficiency has been studied by analysis of the NO/NO_x-ratio with a chemiluminescence instrument before and after the converter. Experimental work with the purpose of deciding the iron sulphate-converter specificity for NO_2 has been made by adding components, present in flue gas to the sample gas. X-ray diffraction has been used to describe reaction products and determine different crystalline phases of ferrous sulphate. Long-run tests to investigate total conversion capacity, and field tests measuring of NO_x in flue gas with different composition, have been carried out. The results show that, when using iron(II)sulphate for reduction of NO_2, parameters such as temperature and dew point are important. The conversion efficiency as well as the capacity were shown to be strongly influenced by temperature and dew point. The conversion reaction has, however been shown to be specific to NO_2, which is an important aspect in flue gas measuring. The high capacity of iron sulphate which have been shown in laboratory tests can not be transferred to measurements in flue gas. The results from the field tests show that an iron sulphate converter can be used under shorter measuring periods, but the conversion efficiency is reduced under longer periods and the capacity is not comparable to conventional converters. 19 refs, 19 figs, 7 tabs, 3 appendices

16513 (UCRL-ID–119565) **Calculation of a residual mean meridional circulation for a zonal-mean tracer transport model.** Choi, W.K. (Lawrence Livermore National Lab., CA (United States). Global Climate Research Div.); Rotman, D.A.; Wuebbles, D.J. Lawrence Livermore National Lab., CA (United States). [1995]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009474. Source: OSTI; NTIS; GPO Dep.

Because of their computational advantages, zonally-averaged chemical-radiative-transport models are widely used to investigate the distribution of chemical species and their change due to the anthropogenic chemicals in the lower and middle atmosphere. In general, the Lagrangian-mean formulation would be ideal to treat transport due to the zonal mean circulation and eddies. However, the Lagrangian formulation is difficult to use in practical applications. The most widely-used formulation for treating global atmospheric dynamics in two-dimensional models is the transformed Eulerian mean (TEM) equations. The residual mean meridional circulation (RMMC) in the TEM system is used to advect tracers. In this study, the authors describe possible solution techniques for obtaining the RMMC in the LLNL two-dimensional chemical-radiative-transport model. In the first section, the formulation will be described. In sections 3 and 4, possible solution procedures will be described for a diagnostic and prognostic case, respectively.

16514 (UCRL-ID–119749) **Recent upgrades and enhancements of the FEM3A model.** Chan, S.T. Lawrence Livermore National Lab., CA (United States). Dec 1994. 56p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009560. Source: OSTI; NTIS; GPO Dep.

In 1984, the US Army Edgewood Research, Development and Engineering Center began to fund Lawrence Livermore National Laboratory to further develop FEM3, a fully three-dimensional heavy-gas dispersion model, as a research tool for studying the atmospheric transport and diffusion of certain chemical systems. As a result, a significantly improved version of the model, called FEM3A, was delivered to ERDEC in 1988. During the past few years, two more major improvements have been developed and tested. They are: improved mass conservation for treating dispersion scenarios with large density variations, and the addition of an advanced turbulence submodel based on the k-ε transport equations. These enhancements have resulted in substantial improvements in the dispersion simulations of heavy-gases and can greatly extend the range of applicability of the model, including the ability to treat problems with large density variations and dispersion scenarios of much greater complexities. Documented in this report are the new features and some of the improvements obtained with the new model.

16515 (UCRL-JC–118404) **Numerical simulation of the Langevin equation for skewed turbulence.** Ermak, D.L. (Lawrence Livermore National Lab., CA (United States)); Nasstrom, J.S. Lawrence Livermore National Lab., CA (United States); EG and G Energy Measurements, Inc., Pleasanton, CA (United States). Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265 ; W-7405-ENG-48. (CONF-950381–1: 11. symposium on boundary layers and turbulence, Charlotte, NC (United States), 27-31 Mar 1995). Order Number DE95009477. Source: OSTI; NTIS; GPO Dep.

In this paper the authors present a numerical method for the generalized Langevin equation of motion with skewed random forcing for the case of homogeneous, skewed turbulence. The authors begin by showing how the analytic solution to the Langevin equation for this case can be used to determine the relationship between the particle velocity moments and the properties of the skewed random force. They then present a numerical method that uses simple probability distribution functions to simulate the effect of the random force. The numerical solution is shown to be exact in the limit of infinitesimal time steps, and to be within acceptable error limits when practical time steps are used.

16516 (UCRL-JC–118405) **Large-eddy simulation of the development of stably-stratified atmospheric boundary layers over cool flat surfaces.** Cederwall, R.T. Lawrence Livermore National Lab., CA (United States). Dec 1994. 6p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950381–2: 11. symposium on boundary layers and turbulence, Charlotte, NC (United States), 27-31 Mar 1995). Order Number DE95009574. Source: OSTI; NTIS; GPO Dep.

The stable boundary layer (SBL) has received less attention in atmospheric field studies, laboratory experiments, and numerical modeling than other states of the atmospheric boundary layer. The low intensity and potential intermittency of turbulence in the SBL make it difficult to measure and characterize its structure. Large-eddy simulation (LES) offers an approach for simulating the SBL and, in particular, its evolution from the onset of surface cooling. Traditional approaches that involve Reynolds-averaged models of turbulence are not able to simulate the stochastic nature of the intermittent turbulence that is associated with the SBL. LES shows promise in this area through its explicit calculation of turbulent eddies at resolved scales. In the LES approach, the Navier-Stokes equations governing the flow are averaged (filtered) over some small interval, such as one or more cells of the computational grid. The grid size is small enough so that large eddies, which carry most of the turbulent energy, are explicitly calculated. The turbulence associated with the subgrid-scale (SGS) eddies is modeled. In the Reynolds-averaging approach, on the other hand, the turbulence model must account for all scales of turbulence. Thus the advantage of LES is that the choice of turbulence parameterization for the SGS turbulence is not nearly as critical as in the Reynolds-averaged approach. Complications faced by turbulence models, such as anisotropy and pressure-strain correlations, are associated mainly with large, energy-containing eddies. LES offers the potential for more realistic simulations since the more complicated features of turbulence are calculated explicitly. The ability of LES to simulate the stochastic behavior of turbulence makes this approach suitable for developing and testing stochastic models of turbulent diffusion. One of the goals of the present work is to provide stochastic datasets to be used in such studies.

16517 (WHC-SA–2809) **A comparison of models to assess the atmospheric dispersion of resuspended radionuclides on the Nevada Test Site.** Green, J.R. (Westinghouse Hanford Co., Richland, WA (United States)); Eckart, R.E. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941102–42: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95010064. Source: OSTI; NTIS; INIS; GPO Dep.

A study of computer codes was made to determine the suitability of their use for modeling radionuclide dispersion from attachment to fugitive dust at the GMX safety shot area of the Nevada Test site. Two codes, the Industrial Source Complex 2 Long Term Model (ISCLT2) and the Fugitive Dust Model (FDM), were subsequently chosen to model the GMX site. Dose calculations were performed using the output values generated by the computer codes. The concentration values produced by the two codes were within a factor of two of each other and were not significantly different. The FDM, however, was felt to be a more useful code for use in calculating doses caused by attachment to fugitive dust.

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Refer also to citation(s) 14752, 14968, 14971, 15007, 15010, 15021, 15025, 15032, 15035, 15036, 15037, 15038, 15041, 15042, 15044, 15132, 15136, 15138, 15139, 15140, 15144, 15145, 15153, 15154, 15155, 15156, 15166, 15173, 15174, 15183, 15184, 15316, 15648, 15649, 15660, 16175, 16413, 16426, 16451, 16454, 16502, 16629, 16703, 16704, 16705, 16711, 16713, 17331

16518 (ANL/ESD/TM–82) **Geophysical exploration in the Lautertal at the Combat Maneuver Training Center, Hohenfels, Germany.** Heigold, P.C.; Thompson, M.D.; Borden, H.M. Argonne National Lab., IL (United States). Oct 1994. 73p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95009317. Source: OSTI; NTIS; GPO Dep.

Geophysical exploration was conducted in the Lautertal at the Combat Maneuver Training Center, Hohenfels, Germany, to determine the shallow geological framework of a typical dry valley in this karstic environment. The complementary methods of electromagnetic surveying, vertical electrical soundings, and seismic refraction profiling were successful in determining the depth and configuration of the bedrock surface, the character of the unconsolidated deposits resting on the bedrock surface, and the nature of the bedrock surface. Channels and other depressions in the bedrock surface are aligned with structurally induced fractures in the bedrock. The unconsolidated deposits consist of coarse alluvium and colluvium, which are confined to these channels and other depressions, and fine-grained loam and loess, which cover most of the Lautertal. Wide ranges in the electrical and elastic parameters of the bedrock surface are indicative of carbonate rock that is highly fractured and dissolved at some locations and competent at others. Most local groundwater recharge occurs in the uplands where the Middle Kimmeridge (Delta) Member of the Maim Formation (Jurassic) is widely exposed. These carbonate rocks are known to be susceptible to dissolution along the fractures and joints; thus, they offer meteoric waters ready access to the main shallow aquifers lower in the Malm Formation. These same rocks also form the bedrock surface below many of the dry valleys, but in the Lautertal, the infiltration of meteoric waters into the subsurface is generally impeded by the surficial layer of fine-grained loam and loess, which have low hydraulic conductivity. Further, the rocks of the Middle Kimmeridge Member appear to be closely associated with the localized occurrence of turbidity in such perennial streams as the Lauterach.

16519 (BNL–61426) **Remediation options for a chromium contaminated landfill using cementitious grouts.** Allan, M.L. (Brookhaven National Lab., Upton, NY (United States). Dept. of Applied Science); Kukacka, L.E. Brookhaven National Lab., Upton, NY (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950216–105: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95009544. Source: OSTI; NTIS; GPO Dep.

In-situ remediation of a chemical waste landfill with excessive chromium levels is being investigated as part of the Mixed Waste Landfill Integrated Demonstration. This paper is concerned with the design of advanced cementitious grouts for in-situ stabilization of chromium contaminated soil and in-situ installation of subsurface containment barriers. Grouts have been developed to improve the performance and cost effectiveness of remediation compared with conventional materials. In addition to restoration of chromium contaminated soils, the developed grouts have applications in other environmental operations where superior properties are required.

16520 (CONF-9503120–1) **Radionuclide containment in soil by phosphate treatment.** Lee, S.Y. (Oak Ridge National Lab., TN (United States)); Francis, C.W.; Timpson, M.E.; Elless, M.P. Oak Ridge National Lab., TN (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States);Korea Inst. of Nuclear Safety, Taejon (Korea, Republic of). DOE Contract AC05-84OR21400. From Instructions for the Hazardous Materials Resources Institute conference; Atlanta, GA (United States); 14-15 Mar 1995. Order Number DE95009026. Source: OSTI; NTIS; INIS; GPO Dep.

Radionuclide transport from a contaminant source to groundwater and surface water is a common problem faced by most US Department of Energy (DOE) facilities. Containment of the radionuclide plume, including strontium-90 and uranium, is possible using phosphate treatment as a chemical stabilizer. Such a chemical process occurs in soils under natural environmental conditions. Therefore, the concept of phosphate amendment for radiostrontium and uranium immobilization is already a proven principle. In this presentation, results of bench-scale experiments and the concept of a field-scale demonstration are discussed. The phosphate treatment is possible at the source or near the advancing contaminant plume. Cleanup is still the ideal concept; however, containment through stabilization is a more practical and costeffective concept that should be examined by DOE Environmental Restoration programs.

16521 (DOE/MC/29109–3958) **Road Transportable Analytical Laboratory (RTAL) system.** Engineering Computer Optecnomics, Inc., Annapolis, MD (United States). Dec 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE95000049. Source: OSTI; NTIS; INIS; GPO Dep.

The problem of groundwater contamination at a large number of industrial facilities is well known. Many US Army and Department of Energy (DOE) facilities share this problem of potentially contaminated water as a result of past disposal practices associated with military and energy source development activities. A wide range of contaminants are found at certain installations encompassing industrial pollutants and military-unique materials. The US Army Biomedical Research and Development Laboratory has been conducting research for a number of years on developing better means to determine the hazards associated with exposure to these types of complex mixtures. The methods involve the use of aquatic organisms together with in vitro mutagenicity assays and analytical chemistry in an integrated biological assessment of a specific site. Integrated Biological Assessment is an important development in the Army's continuing efforts to locate, clean and monitor sites contaminated as a result of military operations. This method provides meaningful hazard data regarding whether a test medium contains low levels of industrial or military-unique contaminants. This is an important advance in determining which sites are clean and which require remediation. It provides continuing monitoring of the effectiveness of remediation operations. Engineering Computer Opteconomics (ECO), Inc. was tasked, in a collaborative Army and DOE effort, to develop a transportable Integrated Biological Assessment Laboratory Complex. This multimodular Complex is designed to be taken into remote areas to provide the necessary long-term on-site research for determining hazards from low levels of contamination in the environment. Each module of the Complex is designed to be self-sufficient, to provide a safe environment for the operators, and a controlled environment for the test organisms and related critical chemical and biological analyses.

16522 (DOE/MC/29118–95/C0428) **Field-usable portable analyzer for chlorinated organic compounds.** Buttner, W.J. Transducer Research, Inc., Naperville, IL (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29118. (CONF-9411149–27: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007970. Source: OSTI; NTIS; GPO Dep.

Using an advanced chemical sensor, a hand portable analytical instrument for selectively detecting vapors of chlorinated solvents

was produced. Phase I involved the development and testing of the analyzer and samplers for vapors over a broad concentration range from different sample matrices. The instrument, the RCL MONITOR, was tested in actual hazardous waste site operations. Phase II (initiated June 1994) involves production of full scale units and deployment in actual DOE operations (Hanford, INEL, Savannah River).

16523 (DOE/MC/29467–4036) **Decontamination systems information and research program. Quarterly technical progress report, October 1–December 31, 1994.** West Virginia Univ., Morgantown, WV (United States). Dept. of Civil and Environmental Engineering. Feb 1995. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95010526. Source: OSTI; NTIS; GPO Dep.

The projects reported during this period are categorized into the following five areas. Bioremediation: In situ Bioremediation of Chlorinated Organic Solvents (MC2B), and Microbial Enrichment for Enhancing In Situ Biodegradation of Hazardous Organic Wastes (MC18); Miscellaneous Remediation Technologies: Prefabricated Vertical Drain research (MC-2a), Chemical Destruction of Chlorinated Organic Compounds (MC-6), and Remediation of Hazardous Sites with Steam Reforming (MC-11); Instrumentation: Evaluation of IR and Mass Spectrometric Techniques for On-Site Monitoring (MC-23); Technology Assessments: Winfield Lock and Dam (MC-9); Additional Projects: Environmental Pollution Control Devices Based on Novel Forms of Carbon (MC-17) and Development of Standard Test Protocols and Barrier Design Models for In Situ Formed Barriers (MC26). Summaries of the significant accomplishments for the projects reported during this period are presented.

16524 (DOE/NV–391) **Geophysical investigation, Salmon Site, Lamar County, Mississippi.** International Technology, Inc., Las Vegas, NV (United States). Feb 1995. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-92NV10972. Order Number DE95008215. Source: OSTI; NTIS; INIS; GPO Dep.

Geophysical surveys were conducted in 1992 and 1993 on 21 sites at the Salmon Site (SS) located in Lamar County, Mississippi. The studies are part of the Remedial Investigation/Feasibility Study (RI/FS) being conducted by IT Corporation for the U.S. Department of Energy (DOE). During the 1960s, two nuclear devices and two chemical tests were detonated 826 meters (in) (2710 feet [ft]) below the ground surface in the salt dome underlying the SS. These tests were part of the Vela Uniform Program conducted to improve the United States capability to detect, identify, and locate underground nuclear detonations. The RI/FS is being conducted to determine if any contamination is migrating from the underground shot cavity in the salt dome and if there is any residual contamination in the near surface mud and debris disposal pits used during the testing activities. The objective of the surface geophysical surveys was to locate buried debris, disposal pits, and abandoned mud pits that may be present at the site. This information will then be used to identify the locations for test pits, cone penetrometer tests, and drill hole/monitor well installation. The disposal pits were used during the operation of the test site in the 1960s. Vertical magnetic gradient (magnetic gradient), electromagnetic (EM) conductivity, and ground-penetrating radar (GPR) surveys were used to accomplish these objectives. A description of the equipment used and a theoretical discussion of the geophysical methods are presented Appendix A. Because of the large number of figures relative to the number of pages of text, the geophysical grid-location maps, the contour maps of the magnetic-gradient data, the contour maps of the EM conductivity data, and the GPR traverse location maps are located in Appendix B, Tabs I through 22. In addition, selected GPR records are located in Appendix C.

16525 (DOE/NV/10845–46) **Scoping calculations for groundwater transport of tritium from the Gnome Site, New Mexico.** Pohlmann, K.; Andricevic, R. Nevada Univ., Las Vegas, NV (United States). Water Resources Center; National Regulatory Research Inst., Columbus, OH (United States). Aug 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE95009110. Source: OSTI; NTIS; INIS; GPO Dep.

Analytic solutions are employed to investigate potential groundwater transport of tritium from a radioactive tracer site near the Project Gnome site in southeastern New Mexico. The tracer test was conducted in 1963 and introduced significant quantities of radionuclides to the transmissive and laterally continuous Culebra dolomite. Groundwater in the Culebra near Gnome travels toward a regional discharge point at the Pecos River, a distance of about 10 to 15 km, depending on flow path. Groundwater transport of radionuclides from the Gnome site is therefore of interest due to the proximity of the accessible environment and the 31-year time period during which migration is likely to have occurred. The analytical stochastic solutions used incorporate the heterogeneity observed in the Culebra by treating transmissivity as a spatially correlated random field. The results indicate that significant spreading of tritium will occur in the Culebra dolomite as a result of the combination of relatively high transmissivity, high spatial variability, and high spatial correlation of transmissivity. Longitudinal spreading may cause a very small fraction of tritium mass to arrive at the Pecos River within the 31 years since the tracer test. However, dilution and transverse dispersion will act to distribute this mass over a very large volume, thereby reducing groundwater concentrations. Despite the high degree of spreading, the calculations indicate that most of the tritium remains near the source. At present, the center of mass is estimated to have moved approximately 260 m downgradient of the test location and about 95 percent of the mass is estimated to have remained within about 1 km downgradient.

16526 (DTU-ISVA-PR–75, pp. 1-17) **1. Simulation of turbulent diffusion of suspended sediment by a random walk model.** Deigaard, R.; Asp Hansen, E. Danmarks Tekniske Univ., Lyngby (Denmark). Inst. for Stroemningsmekanik og Vandbygning. 1994. In *Progress report no. 75.* 82p. Order Number DE95766444. Source: OSTI; NTIS.

Diffusion and turbulent diffusion can be modelled as a random walk process. If there is a gradient in the diffusion coefficient, a correction must be introduced to compensate for an artificial drift in the direction of a decreasing diffusion coefficient. Random walk simulations of the time-varying suspended sediment concentration in a turbulent boundary layer are compared with numerical solutions to the turbulent diffusion equation. (au)

16527 (DTU-ISVA-PR–75, pp. 65-82) **5. Turbulent wave boundary layers in semi-3D flow.** Hasbo, P.; Koegh, K.; Asp Hansen, E.; Fredsoee, J. Danmarks Tekniske Univ., Lyngby (Denmark). Inst. for Stroemningsmekanik og Vandbygning. 1994. In *Progress report no. 75.* 82p. Order Number DE95766444. Source: OSTI; NTIS.

A boundary layer model based on the integrated momentum equation for arbitrary flow over a plane wall is presented. The model predicts the time development of the boundary layer thickness, the bed shear stress, and the shear stress direction. The flow in the boundary layer is assumed turbulent and described by a logarithmic velocity variation and a parabolic variation in the velocity direction. The flow outside the boundary layer is assumed to be shear-free. Further, the model is restricted to the special flow case where no spatial variations exist along a certain direction along the plane wall. Hereby the calculations can be squeezed down to the solution of a 2-D flow problem. In the present paper the model is used for calculating flow cases where flow particle orbits outside the boundary layer are closed curves and described by ellipses. This flow situation occurs for instance above the bed under 3-D waves with no mass transport, or along a vertical wall approached by oblique waves. (au)

16528 (ENEA-RT-AMB–92-17) **Evaluation of impact from Chernobyl accident.** Cigna, A.A. (ENEA, Saluggia (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute). ENEA, Saluggia (Italy). Centro Ricerche Energia. May 1993. 39p. (RT/AMB–92-17). Order Number DE95771049. Source: OSTI; NTIS (US Sales Only).

The impact on society of the Chernobyl accidents is assessed. The situation prior to Chernobyl with respect to regulations of radiation protection against the consequences of a major accident is considered. The development of the recommendations and regulations issued by the Commission of the European Communities for the Maximum Permitted Levels of different groups of radionuclides

in foodstuffs in reviewed. The different reactions to the accident are examined and some data on the average individual effective dose equivalents estimated in a number of countries are also reported. A simple and reliable method to evaluate the levels of Cs ^{134}, Cs ^{137} and Cs ^{90} in green vegetables, hay and milk on the basis of the soil deposition only is described and experimental results are given. The model appears to be rather conservative and to overestimate the contamination. Finally some main problems concerning the information of the public and the preparedness for possible future accidents are also summarized.

16529 (ETDE-IT–95-15) **Two laser excitation technique to monitor plant fluorescence.** Barbini, R. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Colao, F.; Fantoni, R.; Palucci, A.; Ribezzo, S. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. 1994. 8p. (CONF-941269–1: International conference on lasers '94, Quebec (Canada), 12-16 Dec 1994). Order Number DE95771046. Source: OSTI; NTIS (US Sales Only).

The two-pulses laser induced fluorescence technique to monitor the plant photosynthetic activity has been investigated both theoretically and experimentally. A mathematical model has been developed to describe possible relaxation processes occurring in the photosynthetic apparatus under single or dual laser excitations. Experimental results obtained by the two-pulses technique are reported and compared with model predictions.

16530 (FEMP–2384) **Determination of total and isotopic uranium by inductively coupled plasma-mass spectrometry at the Fernald Environmental Management Project.** Miller, F.L.; Bolin, R.N.; Feller, M.T.; Danahy, R.J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-9410207–2: Symposium on applications of inductively coupled plasma mass spectrometry (ICP-MS) to radionuclide determinations, Gatlinburg, TN (United States), 11-13 Oct 1994). Order Number DE95009012. Source: OSTI; NTIS; INIS; GPO Dep.

At the Fernald Environmental Management Project (FEMP) in southwestern Ohio, ICP-mass spectrometry (ICP-MS), with sample introduction by peristaltic pumping, is used to determine total and isotopic uranium (U-234, U-235, U-236 and U-238) in soil samples. These analyses are conducted in support of the environmental cleanup of the FEMP site. Various aspects of the sample preparation and instrumental analysis will be discussed. Initial sample preparation consists of oven drying to determine moisture content, and grinding and rolling to homogenize the sample. This is followed by a nitric/hydrofluoric acid digestion to bring the uranium in the sample into solution. Bismuth is added to the sample prior to digestion to monitor for losses. The total uranium (U-238) content of this solution and the U^{235}/U^{238} ratio are measured on the first pass through the ICP-MS. To determine the concentration of the less abundant U^{234} and U^{236} isotopes, the digestate is further concentrated by using Eichrom TRU-Spec extraction columns before the second pass through the ICP-MS. Quality controls for both the sample preparation and instrumental protocols will also be discussed. Finally, an explanation of the calculations used to report the data in either weight percent or activity units will be given.

16531 (GTK-YST–85) **The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.** Ruskeeniemi, T. (Geological Survey of Finland, Espoo (Finland)); Blomqvist, R.; Suksi, J.; Niini, H. Geological Survey of Finland, Espoo (Finland). 1994. 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

Nuclear waste disposal research.

The report gives a summary of the results of investigations carried out in 1993 at the Palmottu natural analogue study site, which comprises a small U-Th mineralization in Nummi-Pusula, southwestern Finland. Additionally, the report includes several separate articles dealing with various aspects of the Palmottu Analogue Project: (1) 3-dimensional model of fracture zones, (2) redox chemistry of uranium in groundwater, (3) humic substances in groundwater, (4) uranium mineralogy, (5) importance of selective extractions in uranium migration studies, (6) modelling of matrix diffusion, and (7) uranium in surficial deposits. The Palmottu Analogue Project aims at a more profound understanding of radionuclide transport processes in fractured crystalline bedrock. The essential factors controlling transport are groundwater flow and interaction between water and rock. Accordingly, the study includes (1) structural interpretations partly based on geophysical measurements, (2) hydrological studies including hydraulic drill-hole measurements, (3) flow modelling, (4) hydrogeochemical characterization of groundwater, uranium chemistry and colloid chemistry, (5) mineralogical studies, (6) geochemical interpretation and modelling, (7) studies on mobilization and retardation of uranium, and (8) modelling of uranium series data. Paleohydrogeological aspects are of special interest, due to the anticipated future glaciation of the Fennoscandian Shield. Surficial sediments and waters are studied to gain information on postglacial migration in the overburden. (orig.)

16532 (GTK-YST–85, pp. 7-24) **The Palmottu analogue project: overview for 1993.** Ruskeeniemi, T. (Geological Survey of Finland, Espoo (Finland)); Blomqvist, R.; Suksi, J.; Niini, H. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

This article gives a summary of the activities carried out within the Palmottu analogue project in 1993. It consists of (1) an introductory part, followed by (2) a geological description of the site, and (3)an up-to-date summary of the results of the project. (orig.) (33 refs., 6 figs.).

16533 (GTK-YST–85, pp. 25-36) **3-dimensional model of fracture zones of Palmottu study site.** Paananen, M. (Geological Survey of Finland, Espoo (Finland)); Lindberg, A.; Ahonen, L.; Carlsten, S. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

The structural features of the Palmottu U-Th-deposit were studied by geophysical measurements and drill core loggings, the main focus of interest being in recognizing fractures or fracture zones that might be important pathways for groundwater flow. In order to determine the location and geometry of most important hydraulic zones, several different geophysical measurements including mise-a-la-masse, ground penetrating radar, borehole radar and hydraulic tests were carried out. In addition, fractures and fracture infilling were characterized from 21 drill holes. (18 refs., 7 figs., 3 tabs.).

16534 (GTK-YST–85, pp. 37-48) **Redox chemistry of uranium in groundwater of Palmottu uranium deposit, Finland.** Ervanne, H. (Helsinki Univ. (Finland). Dept. of Radiochemistry); Jaakkola, T.; Ahonen, L.; Blomqvist, R. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

Groundwater redox conditions and oxidation states of dissolved uranium were studied from natural water samples around a uranium deposit. A good consistency between dissolved U(IV)/U(VI) ratio and the measured redox potential value were observed. Dissolved redox pairs were studied in a uranium-rich groundwater sample by monitoring the Eh-change caused by acid/base addition. The results indicated that dissolved uranium in concentration of 0.8 μ mol/l may give nernstian response at platinum electrode. (orig.) (19 refs., 5 figs., 3 tabs.).

16535 (GTK-YST–85, pp. 49-52) **Humic substances in groundwater.** Vuorinen, U. (Technical Research Centre of Finland, Espoo (Finland). Reactor Lab.); Aalto, H. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

Humic substances and their importance in groundwater is shortly outlined. A description of a method for isolating humic substances from groundwater in the field and for further characterisation is

being tested with commercial humic acid (Aldrich), as well as gel-permeation method for determining the molecular weight. bedrock, it affords the opportunity of studying the stability and alteration of uraninite as an analogue for spent nuclear fuel under various redox conditions. (orig.) (6 refs.).

16536 (GTK-YST–85, pp. 53-64) **Uraninite and its alternation at Palmottu - A possible natural analogue for spent fuel under reducing conditions.** Ruskeeniemi, T. (Geological Survey of Finland, Espoo (Finland)); Blomqvist, R.; Ahonen, L. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

Uraninite is the major uraniferous mineral in the Precambrian U-Th rich pegmatites at Palmottu. Most euhedral uraninite grains were partially altered by silica-rich hydrothermal solutions during the late stage pegmatitic crystallization. The dominant secondary mineral is uranium silicate, with a chemical composition similar to that of coffinite ($USiO_4$ * Nh_2O). The simultaneous formation of galena and other sulfides with the uranium silicate indicates that the alteration took place under reducing conditions. Hence, uranium occurs predominantly in the uranous (U^{4+}) state. Preliminary mass balance calculations imply that significant amounts of U, Th, and Pb were released during the replacement process. As the Palmottu U-Th deposit extends from ground level to distinctly reduced parts of the bedrock, it affords the opportunity of studying the stability and alteration of uraninite as an analogue for spent nuclear fuel under various redox conditions. (orig.) (28 refs., 5 figs., 1 tab.).

16537 (GTK-YST–85, pp. 65-75) **Selective extractions in uranium migration studies - Findings from a natural analogue study at Palmottu.** Suksi, J. (Helsinki Univ. (Finland). Dept. of Radiochemistry); Saarinen, L.; Ruskeeniemi, T. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

The usefulness of chemical extractions in the study on uranium migration is considered in the light of the results compiled at Palmottu. Chemical extractions provide a method for evaluating the mass transfer of U and its retardation in geochemical cycling. The present detailed study provides more specific information on the in situ fixation of U on rock materials. The many observations made at Palmottu show the potential of the method to fill the gap in interpretations between the natural partitioning of U in rock and the distribution of artificial tracers determined by the short-term laboratory experiments. (orig.) (20 refs., 4 figs., 1 tab.).

16538 (GTK-YST–85, pp. 77-87) **Modelling prospects for in situ matrix diffusion at Palmottu natural analogue site, SW Finland.** Rasilainen, K. (Technical Research Centre of Finland, Espoo (Finland). Nuclear Engineering Lab.); Suksi, J. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

Concentration distributions of natural decay chains 4n+2 and 4n+3 in crystalline rock intersected by a natural fracture were measured. Calcite coating on the same fracture surface was dated. Material properties of the rock matrix, and nuclide concentrations in groundwater were measured. The interpretation of the concentration distributions is based on the classical matrix diffusion concept. Although support was obtained, this calibration exercise does not yet validate the model. Besides initial and boundary conditions, matrix properties are uncertain due to the small amount of rock material. Experimental sorption data was not available, but its importance and the need for systematic studies was demonstrated. (orig.) (10 refs., 5 figs., 5 tabs.).

16539 (IAEA-TECDOC–788, pp. 21-43) **Processes controlling the chemical composition of natural waters in the Hreppar-Land in Southern Iceland.** Arnorsson, S. (Iceland Univ., Reykjavik (Iceland). Science Inst.); Andresdottir, A. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

This contribution describes the processes controlling the chemical and isotopic composition of cold and geothermal waters (5-150 deg. C) in the Hreppar-Land area in southern Iceland. The chemical composition of surface-and cold groundwaters are controlled by the salt content of the precipitation, rock dissolution and organic CO_2 from the soil. The dissolved solids content of the geothermal waters is higher than that of the cold waters and it increases with temperature. The cause is increased rock dissolution. Chloride and boron are considered to act as essentially mobile elements in the Icelandic surface- and ground water environment. The Cl-B relationships in the waters are considered to reflect that the geothermal water represents local precipitation. Yet, the $\delta\ ^2H$ values of these waters tend to be lower than that of local waters. This difference is not considered to reflect a distant recharge areas to the geothermal systems on higher ground inland but due to the presence of a small component of "ice-age water" in the geothermal water that entered the bedrock during the deglaciation period, even earlier, when the $\delta\ ^2H$ of meteoric water in Iceland was much lower than that of today's precipitation. 26 refs, 11 figs, 3 tabs.

16540 (IAEA-TECDOC–788, pp. 113-125) **Environmental isotope-aided studies on geothermal water in the republic of Korea.** Ahn, J.S. (Korea Atomic Energy Research Inst., Taejon (Korea, Republic of)); Koh, Y.K. International Atomic Energy Agency, Vienna (Austria). Feb 1995. (CONF-9310427–: Final research co-ordination meeting on the application of isotope and geochemical techniques to geothermal exploration in the Middle East, Asia, the Pacific and Africa, Dumaguete City (Philippines), 12-15 Oct 1993). In *Isotope and geochemical techniques applied to geothermal investigations. Proceedings of the final research co-ordination meeting held in Dumaguete City, Philippines, 12-15 October 1993.* 268p. Order Number DE95627729. Source: OSTI; NTIS (US Sales Only); INIS.

The typical geothermal water in the Yusung geothermal area, Korea, located in Mesozoic plutonic rocks, has been studied for its characteristics by means of analyzing its tritium, oxygen-18, deuterium and chemical composition. Cold waters, including waters of superficial origin in the same area, were also studied. Deuterium and oxygen-18 contents of thermal groundwater indicate its meteoric-water origin and show the absence of recognizable oxygen isotope (^{18}O) shift to high oxygen-18 composition, likely due to relatively low reservoir temperature. The chemical composition of the Yusung geothermal waters shows that they are partially equilibrated and have mixed with the fresh waters in the upflow. Temperature obtained from the Na-K geothermometer is considered to be reasonably representative of reservoir temperatures. The K-M g geothermometer re-equilibrates rapidly upon cooling and yields for that reason low temperature estimates. Reservoir temperature, according to the Na-K geothermometer, are between 103 deg. C and 133 deg. C. It is inferred that the source of heat is magmatic. The best permeability is considered to be fault controlled. (author). 11 refs, 17 figs 3 tabs.

16541 (IC–95/35) **Effect of source depth correction on the estimation of earthquake size.** Romanelli, F. (Universita degli Studi di Trieste, Trieste (Italy). Istituto di Geodesia e Geofisica); Panza, G. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 7p. Grant CNR 92-02876-54; 93-02492-54; EPOC-CT91-0042; EV5V-CT94-04 Order Number DE95627758. Source: OSTI; NTIS (US Sales Only); INIS.

The relationship between surface wave magnitude, M_s, and seismic moment, M_o, of earthquakes is essential for the estimation of seismic risk in any region. In the hypothesis of constant stress drop, theoretical models predict that Log M_o and M_s are related by a linear law. The slope most commonly found in the literature is around 1.5. Here we show that the application to the Ms values of the necessary correction for the focal depth, gives a general increment of the correlation coefficient, and that a slope around 1.0 is

consistent with the global data, while for regionalized data it can vary from about 1.0 to 2.0. (author). 14 refs, 3 tabs.

16542 (INIS-BR–3482) **Isotope exchange kinetic of phosphorus in soils from Pernambuco State -Brazil.** Figueiredo, F.J.B. de. Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear. Dec 1989. 83p. (In Portuguese). Order Number DE95626503. Source: OSTI; NTIS (US Sales Only); INIS.

PRONUCLEAR. Tese de Mestrado, 51.

The applicability of isotopic exchange kinetics of ^{32} p to characterize phosphorus available to plants and to diagnose the reactivity of soil-fertilizer-P in six soils from Pernambuco is described. This methodology was compared with anion exchange resin, isotopic exchange equilibrium methods (E-value and L-value) and P absorption by plants. The first greenhouse experiment had the following treatments: (1) with P and, (2) with addition of 43.7 mg P/Kg of soil, incubated for O, 42 and 84 days before seeding. The kinetic of isotopic exchange (KIE), resin-P and E-value were determined before seeding and after harvesting pearl millet grown for 42 days. Results indicated that the KIE parameters rated the soils more efficiently, in terms of available P and soil-fertilizer-P reactivity, than resin-P, E-value and L-value. (author). 38 refs, 2 figs, 18 tabs.

16543 (INIS-BR–3483) **Feasibility study of photodiodes utilization in the soil-moisture determination by gamma transmission.** Santos, L.A.P. dos. Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear. Aug 1992. 71p. (In Portuguese). Order Number DE95626519. Source: OSTI; NTIS (US Sales Only); INIS.

PRONUCLEAR. Tese de Mestrado, 59.

This study was done to verify the viability of photodiodes, as gamma radiation detector (^{241} Am - Energy=60 KeV), to measure soil water content. The photodiodes used had different mechanical and electrical characteristics, and were tested on soils of different textures. A good linear correlation between the logarithm of the attenuation factor and soil-moisture demonstrated such viability, and that the low photopeak efficiency of these devices is not a limitation to the measurement of soil water content. Furthermore, the stability, the portability, and low cost of such semiconductor devices, including its electronic system, represent relevant characteristics that may justify the development of a reliable gamma meter system for field studies. (author). 37 refs, 21 figs, 20 tabs.

16544 (INIS-BR–3485) **Radiological impact assessment of building materials on ordinary houses dwellers.** Campos, M.P. de. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1994. 72p. (In Portuguese). Order Number DE95626504. Source: OSTI; NTIS (US Sales Only); INIS.

The radiological impact due to building materials on habitants living in the Santo Andre district of Sao Paulo state, Brazil, was assessed through the total effective dose equivalent rate determination, for external and internal irradiation. The effective dose equivalent rate for external irradiation was calculated by the gamma spectrometry determination of natural radionuclides specific activity in the dwelling materials. The effective dose equivalent rate due to ^{222} Rn inhalation was calculated through the radon indoor activity determination by using solid state nuclear track detectors. (author). 46 refs, 6 figs, 14 tabs.

16545 (INIS-BR–3487) **Unsaturated hydraulic conductivity of a red-yellow podzolic soil in the Northern Zona da Mata of Pernambuco State - Brazil.** Maciel Netto, A. Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear. Aug 1994. 115p. (In Portuguese). Order Number DE95626520. Source: OSTI; NTIS (US Sales Only); INIS.

The determination of the hydraulic conductivity of a Red-Yellow Podzolic Soil was carried out during an experiment in a plot measuring 3.5 m x 3.5 m, at the Experimental Station of Itapirema, Goiania, in Pernambuco State, Brazil. The internal drainage method proposed by Hillel (1972) was used to obtain the hydraulic conductivity as a function of soil water content, $K(\theta)$, in the three characteristic horizons of the soil. Three neutron probes were used for measuring the humidity, that was determined by a calibration curve. Three characteristic horizons of the Red-Yellow Podzolic Soil were investigated for hydraulic conductivity. The sandy A horizon, with large pores, has a high conductivity while the B1t horizon, with a massive structure and few visible pores, has a low infiltration rate. The hydraulic dynamics of the B2 horizon is more complex due to its heterogeneity. (author). 79 refs, 17 figs, 11 tabs.

16546 (INIS-mf–14524) **Rapid determination of soil contamination by helicopter gamma ray spectroscopy.** Winkelmann, I. Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. 1994. 12p. (In German). (CONF-9410338–: Environmental Radioactivity: national seminar with international participation, Sofia (Bulgaria), 11-13 Oct 1994). Order Number DE95627722. Source: OSTI; NTIS (US Sales Only); INIS.

Specific aerial nuclide measurements of surface soil contamination were performed after the Chernobyl accident in the southern part of Germany. A helicopter equipped with a gamma ray spectroscopic system including a HPGe detector (50% relative efficiency) and 3 NaI(Tl)-detectors (volume 12 l) was used. A detailed description is given of the complete measuring system which can also be used for detection of gamma sources, e.g. radioactive fragments of nuclear powered satellites. At an altitude of 100 m, a soil contamination of several kBq/m^2 for ^{134}Cs and ^{137}Cs can be measured for 60 s at a helicopter speed of 100 km/h. For detection of point gamma sources, the NaI(Tl)-detector was used. Assuming a line spacing of 300 m and a speed of 100 km/h, an area of about 30 km^2 can be surveyed per hour. Thus ^{60}Co-sources of some GBq activity can be detected. The system was practically applied for the first time for measuring the man-made radionuclides. The chosen distance between the routes was 10 km, and measuring time - 60 s for each spectrum corresponding to a flight path distance of about 2.2 km over which the average soil contamination was determined. The measured ^{137}Cs values of up to 25 kBq/m^2 are in good agreement with the results obtained by other methods (in-situ-spectrometry, measurements of soil samples). The aerial measuring system was also tested in the former USSR, in a region north of Chernobyl, with nuclide deposition values of up to 2 MBq/m^2. 7 figs., 2 refs. (orig.).

16547 (INIS-mf–14525) **In-situ-gamma ray spectrometry for measurements of environmental radioactivity.** Winkelmann, I. Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. 1994. 21p. (CONF-9410338–: Environmental Radioactivity: national seminar with international participation, Sofia (Bulgaria), 11-13 Oct 1994). Order Number DE95627723. Source: OSTI; NTIS (US Sales Only); INIS.

A detailed description of the method is presented. The range of application is shown. The calibration of the in-situ gamma ray spectrometer with a HPGe semiconductor detector and the evaluation of the spectra are described. A measuring time of about 15-30 min is sufficient to determine the specific natural and man-made radioactivity of the soil of some ten Bq/m^2. The results of soil contamination measurements in Germany after the Chernobyl accident are reported. A total of 22 nuclides are detected. The measured contamination for the first days after the accident was as follows: ^{132}Te/^{132}I - 100 kBq/m^2, and ^{131}I - 70 kBq/m^2. 6 figs., 4 tabs. (orig.).

16548 (INIS-mf–14527) **Intercomparison measurements of surface soil contamination with in-situ gamma ray spectrometry. Pt.1. Artificial radionuclides.** Winkelmann, I. Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. 1994. 9p. (In German). (CONF-9410338–: Environmental Radioactivity: national seminar with international participation, Sofia (Bulgaria), 11-13 Oct 1994). Order Number DE95627724. Source: OSTI; NTIS (US Sales Only); INIS.

This intercomparison program was performed by the Federal Office of Radiation Protection in October 1993. It includes seven laboratory teams from five countries and is applied on a pasture in southern Germany having an undisturbed soil profile. The location was chosen because of its relatively high ^{137}Cs-soil contamination caused by the Chernobyl accident - up to 50 kBq/m^2. The deposition of ^{134}Cs and ^{137}Cs was determined. The comparison demonstrated a good agreement between results from different labs. Additionally, the dose rate at all marked locations was measured and compared to the dose rate of individual radionuclides calculated from the measured spectra. A relatively good agreement was obtained. It is shown that the main contribution to the total

dose rate of 70 nSv/h is made by ^{137}Cs with a value of 5 nSv/h. 4 figs., 2 tabs., 3 refs. (orig.).

16549 (INIS-mf–14529, pp. 39) **Radon measurements for earthquake-prediction research.** Friedmann, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GROUND WATER/radionuclide migration; AUSTRIA; EARTHQUAKES; FORECASTING; MEASURING METHODS; RADON ISOTOPES

16550 (INIS-mf–14530, pp. 29) **Radon measurements for earthquake prediction research.** Friedmann, H. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Mossbauer, L. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GROUND WATER/radionuclide migration; AUSTRIA; COMPUTER CODES; EARTHQUAKES; FORECASTING; MEASURING METHODS; RADON ISOTOPES; ROCKS

16551 (INIS-mf–14530, pp. 30-31) **Isotopic fractionation and radon leakage in loess formations at Stiefern, Lower Austria.** Zimprich, P.; Friedmann, H.; Pak, E.; Leitner-Wild, E.; Hille, P. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FRACTIONATION/isotopes; RADON/leaks; AGE ESTIMATION; AMBIENT TEMPERATURE; ATMOSPHERIC PRECIPITATIONS; AUSTRIA; CARBON 12; CARBON 13; FRACTIONATION; ISOTOPES; OXYGEN 16; OXYGEN 18; PALEOZOIC ERA; PLANTS; RADON; LEAKS; SEDIMENTS

16552 (NEI-DK–1946) **Petroleum hydrocarbons. Compositional changes during biodegradation and transport in unsaturated soil.** Jensen, T.S. Danmarks Miljoeundersoegelser, Roskilde (Denmark); Copenhagen Univ. (Denmark). Nov 1994. 178p. Order Number DE95772352. Source: OSTI; NTIS.

Field and laboratory experiments were conducted to examine the fate and transport of petroleum hydrocarbons in the terrestrial environment. During a 2-year field experiment the change in chemical composition of two crude oils, Arabian Heavy and Gullfax and two refined oils, Fuel 2 and a lubricating oil were analysed using GC/FID and GC/MS. Soil column experiments were conducted to study the leaching of petroleum hydrocarbons under flow conditions similar to those in the field experiments and the leaching was described by the mobile-immobile zones transport model. (au) (48 refs.)

16553 (PNL–10483) **Direct measurement of strontium-90 and uranium-238 in soils on a real-time basis: 1994 summary report.** Schilk, A.J.; Hubbard, C.W.; Knopf, M.A.; Thompson, R.C. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010548. Source: OSTI; NTIS; INIS; GPO Dep.

Traditional methodologies for quantitative characterization of radionuclide-contaminated soils over extended areas are often tedious, costly, and non-representative. A rapid characterization methodology was designed that provides reliable output with spatial resolution on the order of a few meters or less. It incorporates an innovative sensor of square plastic scintillating fibers that has been designed to be placed directly on or above a contaminated soil to detect and quantify high-energy beta particles associated with the decay chains of uranium and/or strontium. Under the direction and auspices of the DOE's Characterization, Monitoring, and Sensor Technology Integrated Program, Pacific Northwest Laboratory (PNL) constructed a high-energy beta scintillation sensor that was optimized for the detection and quantification of uranium and strontium contamination in surface soils (in the presence of potentially interfering natural and anthropogenic radionuclides), demonstrated and evaluated this detector in various field and laboratory scenarios, and provides this document in completion of the aforementioned requirements.

16554 (PNL–10485) **Application of in situ vitrification in the soil subsurface: Engineering-scale testing.** Luey, J.; Seiler, D.K. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010204. Source: OSTI; NTIS; INIS; GPO Dep.

Engineering-scale testing to evaluate the initiation and propagation of the in situ vitrification (ISV) process in the soil subsurface has been completed. Application of ISV in the soil subsurface both increases the applicable treatment depth (beyond a demonstrated 5 m) and allows treatment of local contamination, such as liquid seepage trenches (found on many US Department of Energy sites) that were designed to remove contamination at the bottom of the trench. The following observations and conclusions resulted from the test data: the ISV process can be initiated in the soil subsurface and propagated in both vertical directions, with the downward direction providing greater ease of operation; energy efficiency to process a kilogram of soil was 20% better than for an ISV melt initiated at the soil surface, increased efficiency was attributed to insulation from the soil overburden; the feasibility of initiating the process with a planar starter path was confirmed, thus increasing the number of options for initiating the process in the field; soil subsidence was pronounced and requires attention before field demonstration of subsurface ISV. Further field work at pilot-scale is recommended for this new ISV application. The key step will be the placement of starter material at depth to initiate the process.

16555 (PNL-SA–24663) **A man-portable supercritical fluid extractor.** Wright, B.W.; Zemanian, T.S.; Lee, R.N.; Wright, C.W. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950209–4: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE95009571. Source: OSTI; NTIS; GPO Dep.

A new prototype supercritical fluid extraction (SFE) apparatus has been developed for the on-site preparation of solid matrix samples for subsequent organic analysis. The apparatus consists of two parts, each of which satisfy weight and size requirements for portability. They are a generator module that supplies high-pressure carbon dioxide (the source of which is dry ice) and a briefcase containing a pressure regulator, extraction cells, valves for flow control, flow restriction hardware, equipment for sample collection, temperature control devices, and ancillary supplies. The generator module provides carbon dioxide at pressures to 1 kbar (~14,500 psi), incorporates no moving parts, and allows rapid loading without tools due to novel fingertight closures. Samples are contained in sintered inserts that fit inside three extraction cells that also have rapid, fingertight closures. Analyte collection can be accomplished using liquid solvent or restrictorless rapid depressurization techniques. Control schemes allow operation at a wide variety of pressures and temperatures and the use of static, dynamic, or hybrid static/dynamic extraction strategies. The technical performance of the prototype apparatus was evaluated by comparison of results from the SFE of a soil sample spiked with six to nine organic compounds of environmental interest to Soxhlet extraction.

16556 (SAND–95-0318C) **Geochemical and stable isotope variations in baseflow from an urbanized watershed: White Rock Creek, Dallas, Texas.** Hercod, D.J. (State Medical Univ., Dallas, TX (United States). Dept. of Geological Sciences); Gregory, R.T.; Brady, P.V. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950178–1: 24. water for Texas conference, Austin, TX (United States), 25-26 Jan 1995). Order Number DE95008528. Source: OSTI; NTIS; INIS; GPO Dep.

Public concerns about surface water quality and its impact on health issues have put a premium on the ability to predict surface and groundwater quality in urban areas. The movement of toxins and nutrients in urban areas is largely controlled by interactions with soil and aquifer minerals along hydrologic pathways. Despite

progress in theoretical modeling of the effects of these interactions on water chemistry, it is presently impossible to predict overall trends in urban water quality. Determining the controls on stream water chemistry is problematic due to the interplay between different hydrologic reservoirs which cannot be easily observed or measured. Natural tracers, such as dissolved ions and isotopes, provide an indirect method for observing subsurface interactions and are useful for time series analysis of stream water composition. Ionic species are generally nonconservative components because of chemical reactions and are thus useful for discerning the overall discharge chemistry affected by the relationship.

16557 (SAND–95-0574C) **Offsite demonstrations for MWLID technologies.** Williams, C. (Sandia National Labs., Albuquerque, NM (United States)); Gruebel, R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504135–1: 5. annual waste-management education and research consortium (WERC) technology development conference, Las Cruces, NM (United States), 18-20 Apr 1995). Order Number DE95009585. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of the Offsite Demonstration Project for Mixed Waste Landfill Integrated Demonstration (MWLID)-developed environmental site characterization and remediation technologies is to facilitate the transfer, use, and commercialization of these technologies to the public and private sector. The meet this goal, the project identified environmental restoration needs of mixed waste and/or hazardous waste landfill owners (Native American, municipal, DOE, and DoD); documenting potential demonstration sites and the contaminants present at each site; assessing the environmental regulations that would effect demonstration activities; and evaluating site suitability for demonstrating MWLID technologies at the tribal and municipal sites identified. Eighteen landfill sites within a 40.2-km radius of Sandia National Laboratories are listed on the CERCLIS Site/Event Listing for the state of New Mexico. Seventeen are not located within DOE or DoD facilities and are potential offsite MWLID technology demonstration sites. Two of the seventeen CERCLIS sites, one on Native American land and one on municipal land, were evaluated and identified as potential candidates for off-site demonstrations of MWLID-developed technologies. Contaminants potentially present on site include chromium waste, household/commercial hazardous waste, volatile organic compounds, and petroleum products. MWLID characterization technologies applicable to these sites include Magnetometer Towed Array, Cross-borehole Electromagnetic Imaging, SitePlanner ™/PLUME, Hybrid Directional Drilling, Seamist™/Vadose Zone Monitoring, Stripping Analyses, and x-ray Fluorescence Spectroscopy for Heavy Metals.

16558 (SAND–95-0584C) **Prediction of single-component NAPL behavior for the TEVES Project using T2VOC.** Webb, S.W.; Phelan, J.M. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–2: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95009594. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed simulations have been performed for the TEVES (Thermal Enhanced Vapor Extraction System) Project using the TOUGH2 code considering air, water, and a single-component NAPL. A critical parameter varied in the simulations is the borehole vacuum which directly affects air flow through the system and indirectly influences soil temperatures and water and NAPL fluid masses. Contaminant migration from the heated zone into the unheated soil can occur if the borehole vacuum, or borehole flow rate, is not sufficient. Under these conditions, evaporation of liquids (water and NAPL) due to the heating can cause flow from the heated zone into the unheated soil. Insufficient air sweep may be indicated by a vapor dominated mass flow rate into the borehole, at least for the present configuration. Sufficient air flow through the heated zone must be provided to contain the contaminants within the heated zone.

16559 (SKB-TR–94-17) **Summary report of the experiences from TVO's site investigations.** Oehberg, A. (Saanio and Reikkola Consulting Engineers, Helsinki (Finland)); Saksa, P.; Ahokas, H.; Ruotsalainen, P.; Snellman, M. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). May 1994. 114p. Order Number DE95628653. Source: OSTI; NTIS; INIS.

Teollisuuden Voima Oy (TVO) has completed preliminary site investigations at five sites in Finland. At the end of 1992 TVO presented the final report to the authorities. The preliminary site investigation phase 1986-1992 was conducted according to the investigation programme compiled by TVO. The aim of this report was to compile a report on experiences from TVOs site investigations. The main interest was focused on investigation strategies and the most important investigation methods for the conceptual modelling. The objective of the preliminary site investigations was to obtain data on the bedrock properties in order to evaluate the areas. The programme was divided into four stages, each stage having its own sub-objective. The site-specific investigation programme for each site included a large common part and a small site-specific part. The strategies (objectives) and experiences from different disciplines, geology, hydrogeochemistry, geophysics and geohydrology, are presented in the report. The conceptual modelling work procedure including both bedrock and groundwater modelling is described briefly using the Olkiluoto site as an example. Each of the other areas has undergone similar phases of work. The uncertainties associated with conceptual modelling are also discussed. The usefulness of the investigation strategy and the investigation methods for conceptual modelling is discussed in the report. Some new equipment, methods or enhancements that have not yet been used in TVOs site investigations have become new tools in site characterisation and are briefly presented in the report. 52 refs, 35 figs, 1 tab.

16560 (SKB-TR–94-18) **AECL strategy for surface-based investigations of potential disposal sites and the development of a geosphere model for a site.** Whitaker, S.H. (AECL Research, Whiteshell Labs., Pinawa, MB (Canada)); Brown, A.; Davison, C.C.; Gascoyne, M.; Lodha, G.S.; Stevenson, D.R.; Thorne, G.A.; Tomsons, D. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). May 1994. 108p. Order Number DE95626532. Source: OSTI; NTIS; INIS.

The objective of this report is to summarize AECL's strategy for surface-based geotechnical site investigations used in screening and evaluating candidate areas and candidate sites for a nuclear fuel waste repository and for the development of geosphere models of sites. The report is one of several prepared by national nuclear fuel waste management programs for the Swedish Nuclear Fuel and Waste Management Co. (SKB) to provide international background on site investigations for SKB's R and D programme on siting.The scope of the report is limited to surface-based investigations of the geosphere, those done at surface or in boreholes drilled from surface. The report discusses AECL's investigation strategy and the methods proposed for use in surface-based reconnaissance and detailed site investigations at potential repository sites. Site investigations done for AECL's Underground Research Laboratory are used to illustrate the approach. The report also discusses AECL's strategy for developing conceptual and mathematical models of geological conditions at sites and the use of these models in developing a model (Geosphere Model) for use in assessing the performance of the disposal system after a repository is closed. Models based on the site data obtained at the URL are used to illustrate the approach. Finally, the report summarizes the lessons learned from AECL's R and D program on site investigations and mentions some recent developments in the R and D program. 120 refs, 33 figs, 7 tabs.

16561 (SKB-TR–94-24) **Aespoe Hard Rock Laboratory - feasibility and usefulness of site investigation methods. Experiences from the pre-investigation phase.** Almen, K.E. (ed.) (KEA GEO-Konsult (Sweden)); Olsson, Paer; Rhen, I.; Stanfors, R.; Wikberg, P. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Aug 1994. 162p. Order Number DE95628654. Source: OSTI; NTIS; INIS.

One of the main goals set up by SKB for the Aespoe HRL project is to 'test the quality and appropriateness of different methods for characterizing the bedrock with respect to conditions of importance for a final repository'. An extensive investigation programme was carried out during the projects pre-investigation phase

that in part was based in experience from SKBs previous site investigations and in part entailed the testing of new or other unestablished methods. Previous technical reports have described the methods that have been used and the results, models and predictions that have been produced. All the methods used are discussed in the present report in terms of how they have contributed in different analysis stages to the total geoscientific characterization of the rock at Aespoe. The usefulness of each method for modelling and prediction in different scales is evaluated, and aspects of the practical execution of the methods under different conditions are discussed. The report sheds light on the importance of dividing large investigation programmes such as this one into suitable stages to get an opportunity to evaluate the results obtained and plan in detail the investigations in the next stage. Furthermore, the way in which the characterization/modelling work in different geometric scales has been done for the different investigation stages is discussed, along with whether this has been found to be a suitable approach. The importance of pursuing an interdisciplinary strategy throughout the pre-investigation process cannot be overemphasized. For the planning, execution, analysis and reporting of the results of the pre-investigations, this has been guaranteed by an organization in which an interdisciplinary group has been in charge of the investigations, together with the project manager. 52 refs, numerous tabs and figs.

16562 (UCRL-CR–119484) **Particle filtration: An analysis using the method of volume averaging.** Quintard, M. (L.E.P.T.-ENSAM (UA CNRS), Talence (France)); Whitaker, S. California Univ., Davis, CA (United States). Dept. of Chemical Engineering. Dec 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009467. Source: OSTI; NTIS; GPO Dep.

The process of filtration of non-charged, submicron particles is analyzed using the method of volume averaging. The particle continuity equation is represented in terms of the first correction to the Smoluchowski equation that takes into account particle inertia effects for small Stokes numbers. This leads to a cellular efficiency that contains a minimum in the efficiency as a function of the particle size, and this allows us to identify the most penetrating particle size. Comparison of the theory with results from Brownian dynamics indicates that the first correction to the Smoluchowski equation gives reasonable results in terms of both the cellular efficiency and the most penetrating particle size. However, the results for larger particles clearly indicate the need to extend the Smoluchowski equation to include higher order corrections. Comparison of the theory with laboratory experiments, in the absence of adjustable parameters, provides interesting agreement for particle diameters that are equal to or less than the diameter of the most penetrating particle.

16563 (UCRL-JC–115974) **Chemical and biological systems for regenerating activated carbon contaminated with high explosives.** Knezovich, J.P. (Lawrence Livermore National Lab., CA (United States)); Daniels, J.I.; Stenstrom, M.K.; Heilmann, H.M. Lawrence Livermore National Lab., CA (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9411155–3: 1994 Luxembourg international symposium on the rehabilitation of military sites and demilitarization of explosive ordance, Kirchberg (Luxembourg), 14-18 Nov 1994). Order Number DE95009471. Source: OSTI; NTIS; GPO Dep.

Activated carbon has been used as a substrate for efficiently removing high explosives (HEs) from aqueous and gaseous waste streams. Carbon that is saturated with HEs, however, constitutes a solid waste and is currently being stored because appropriate technologies for its treatment are not available. Because conventional treatment strategies (i.e., incineration, open burning) are not safe or will not be in compliance with future regulations, new and cost-effective methods are required for the elimination of this solid waste. Furthermore, because the purchase of activated carbon and its disposal after loading with HEs will be expensive, an ideal treatment method would result in the regeneration of the carbon thereby permitting its reuse. Coupling chemical and biological treatment systems, such as those described below, will effectively meet these technical requirements. The successful completion of this project will result in the creation of engineered commercial systems that will present safe and efficient methods for reducing the quantities of HE-laden activated carbon wastes that are currently in storage or are generated as a result of demilitarization activities. Biological treatment of hazardous wastes is desirable because the biodegradation process ultimately leads to the mineralization (e.g., conversion to carbon dioxide, nitrogen gas, and water) of parent compounds and has favorable public acceptance. These methods will also be cost- effective because they will not require large expenditures of energy and will permit the reuse of the activated carbon. Accordingly, this technology will have broad applications in the private sector and will be a prime candidate for technology transfer.

16564 (UCRL-JC–118635) **A numerical simulation of groundwater flow and contaminant transport on the Cray T3D and C90 supercomputers.** Ashby, S.F.; Bosl, W.J.; Falgout, R.D.; Smith, S.G.; Tompson, A.F.B.; Williams, T.J. Lawrence Livermore National Lab., CA (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410212–4: Cray user's group conference, Tours (France), 10-14 Oct 1994). Order Number DE95009876. Source: OSTI; NTIS; GPO Dep.

Numerical simulations of groundwater flow and chemical transport through three-dimensional heterogeneous porous media are described. The authors employ two Cray supercomputers for different parts of the decoupled calculation: the flow velocity field is computed on the T3D massively parallel computer and the contaminant migration is simulated on the C90 vector supercomputer. They compare simulation results for subsurface models using homogeneous layers and heterogeneous layers, and they see that the heterogeneities have a profound impact on contaminant migration.

16565 (VTT-TIED–1537) **The speciation of dissolved elements in aquatic solution. Radium and actinides.** Haesaenen, E. (VTT Chemical Technology, Espoo (Finland)). Technical Research Centre of Finland, Espoo (Finland). 1994. 44p. (In Finnish). Order Number DE95628646. Source: OSTI; NTIS; INIS.

In the publication, the chemistry and speciation of radium, thorium, protactinium, uranium, neptunium, lutonium, americium and curium in ground-water environment is reviewed. Special attention is given to the transuranium elements, which have a central role in the repository of nuclear wastes. The most important methods used in the speciation of these elements is presented. The laser-induced methods, developed in the 1980's, are especially discussed. These have made it possible, e.g., to speciate the transuranium elements in their very low, actual repository groundwater concentrations (10-100 ng/l). (54 refs., 10 figs., 3 tabs.).

16566 (VTT-TIED–1556) **The effect of thickness in the through-diffusion experiment.** Lehikoinen, J.; Uusheimo, K.; Valkiainen, M. Technical Research Centre of Finland, Espoo (Finland). 1994. 35p. Order Number DE95628647. Source: OSTI; NTIS; INIS.

The publication contains an experimental study of diffusion in the water filled pores of rock samples. The samples studied are rapakivi granite from Loviisa, southern Finland. The drill-core sample was sectioned perpendicularly with diamond saw and three cylinder formed samples were obtained. The nominal thicknesses (heights of the cylinders) are 2, 4 and 6 cm. For the diffusion measurement the sample holders were pressed between two chambers. One of the chambers was filled with 0.0044 molar sodium chloride solution spiked with tracers. Another chamber was filled with inactive solution. Tritium (HTO) considered to be water equivalent tracer and anionic ^{36}Cl were used as tracers. (9 refs., 19 figs., 2 tabs.).

16567 (WHC-SA–2755) **Testing of a benchscale Reverse Osmosis/Coupled Transport system for treating contaminated groundwater.** Hodgson, K.M.; Lunsford, T.R.; Panjabi, G. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950646–2: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95005984. Source: OSTI; NTIS; INIS; GPO Dep.

The Reverse Osmosis/Coupled Transport process is a innovative means of removing radionuclides from contaminated groundwater at the Hanford Site. Specifically, groundwater in the 200 West Area of the Hanford Site has been contaminated with uranium, technetium, and nitrate. Investigations are proceeding to determine the most cost effective method to remove these contaminants. The process described in this paper combines three different membrane technologies (reverse osmosis, coupled transport, and nanofiltration to purify the groundwater while extracting and concentrating uranium, technetium, and nitrate into separate solutions. This separation allows for the future use of the radionuclides, if needed, and reduces the amount of waste that will need to be disposed of. This process has the potential to concentrate the contaminants into solutions with volumes in a ratio of 1/10,000 of the feed volume. This compares to traditional volume reductions of 10 to 100 for ion exchange and stand-alone reverse osmosis. The successful demonstration of this technology could result in significant savings in the overall cost of decontaminating the groundwater.

16568 (WHC-SD-EN-AP–093) **Site characterization for the W-049H Project.** Mitchell, R.M. Westinghouse Hanford Co., Richland, WA (United States). 25 Mar 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010672. Source: OSTI; NTIS; INIS; GPO Dep.

Objective is to field characterize and sample the soil along the proposed effluent line routes for Project W-049H in the 200 East and West Area; overall plan is to discontinue the disposal of contaminated liquids into the Hanford soil column. General requirements (health, safety; prerequisites) sampling and field activities, quality assurance and quality control are discussed. The information from sampling will be used to determine the need for changes in the proposed routes prior to pipeline construction.

16569 (WHC-SD-EN-TP–032) **Integrated test plan for demonstration of a prompt fission neutron logging tool.** Koegler, K.J. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010673. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the demonstration of the geophysical logging tool as part of the Volatile Organic Compounds Arid Sites Integrated Demonstration (VOC-Arid ID) and the Buried Waste Integrated Demonstration. Purpose is to show that the tool can log cased boreholes at Hanford waste sites for the presence in the soil of fissionable isotopes.

16570 (WHC-SD-EN-WP–012) **Groundwater monitoring plan: 200 Areas treated effluent disposal facility (Project W-049H).** Barnett, D.B.; Davis, J.D.; Collard, L.B.; Freeman, P.B.; Chou, C.J. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 230p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010111. Source: OSTI; NTIS; INIS; GPO Dep.

This groundwater monitoring plan provides information that supports the US Department of Energy's application (DOE-RL 1994) for waste water discharge permit No. WA-ST-4502 from the State of Washington, under the auspices of Washington Administrative Code 173-216. The monitoring plan has two functions: (1) to summarize the results of a 3-yr characterization of the current hydrogeology and groundwater quality of the discharge site and (2) to provide plans for evaluating the effects of the facility's operation on groundwater quality and document compliance with applicable groundwater quality standards. Three wells were drilled to define the stratigraphy, evaluate sediment characteristics, and establish a groundwater monitoring net work for the discharge facility. These wells monitor groundwater quality upgradient and downgradient in the uppermost aquifer. This report proposes plans for continuing the monitoring of groundwater quality and aquifer characteristics after waste water discharges begin.

16571 (Y/DZ–1124) **Thermal decomposition of mercuric sulfide.** Leckey, J.H.; Nulf, L.E. Oak Ridge Y-12 Plant, TN (United States). 28 Oct 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009062. Source: OSTI; NTIS; GPO Dep.

The rate of thermal decomposition of mercuric sulfide (HgS) has been measured at temperatures from 265 to 345 C. These data have been analyzed using a first-order chemical reaction model for the time dependence of the reaction and the Arrhenius equation for the temperature dependence of the rate constant. Using this information, the activation energy for the reaction was found to be 55 kcal/mol. Significant reaction vessel surface effects obscured the functional form of the time dependence of the initial portion of the reaction. The data and the resulting time-temperature reaction-rate model were used to predict the decomposition rate of HgS as a function of time and temperature in thermal treatment systems. Data from large-scale thermal treatment studies already completed were interpreted in terms of the results of this study. While the data from the large-scale thermal treatment studies were consistent with the data from this report, mass transport effects may have contributed to the residual amount of mercury which remained in the soil after most of the large-scale runs.

16572 (YJT–94-20) **The International INTRAVAL project. Summary and conclusions by the TVO/VTT Team.** Hautojaervi, A. (VTT Energy, Espoo (Finland)). Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Dec 1994. 26p. Order Number DE95626509. Source: OSTI; NTIS; INIS.

Teollisuuden Voima Oy (TVO) participated the international cooperation project INTRAVAL and VTT Energy acted as a project team. The Finnish participation focused on flow and transport in crystalline fractured rock and six test cases out of thirteen were tackled. The experimental results were evaluated mainly by means of analytical transport models. The report presents a short review of the experience obtained in the course of the project. It concentrates on the issues revealed in the discussions and analyses of the six test cases in which the TVO/VTT team actively participated but some of the conclusions are even more general in nature. Some suggestions are made for future experimental and theoretical work in the field of geosphere. (15 refs., 2 tabs.).

16573 (Y/SUB–28B-99920C/94-2) **Water balance report for the Oak Ridge Y-12 Plant.** Oak Ridge Y-12 Plant, TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Jul 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009052. Source: OSTI; NTIS; GPO Dep.

The Y-12 Plant, which occupies approximately 800 acres, was built by the Army Corps of Engineers in 1943 as part of the Manhattan Project in Oak Ridge, Tennessee. Recently, Martin Marietta Energy Systems, who manages the Y-12 Plant, has been concerned with the effects of water consumption and losses at the plant facility, and the ability of ground water beneath the site to act as a source of water seepage into East Fork Poplar Creek or as a source of water infiltration into subsurface strata. This has prompted the need to perform a water balance study on the facility. Data regarding all uses of municipal water and sources of discharge from the plant were recorded and then water balance calculations were performed using a computer model developed in a multi-dimensional electronic spreadsheet. This report describes the results of this research and includes the flow data collected during the study.

16574 (Y/SUB–94-99069C/Y15/10/R1) **Site-specific standard request for underground storage tanks 1219-U, 1222-U, 2082-U, and 2068-U at the rust garage facility buildings 9754-1 and 9720-15: Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, Facility ID No. 0-010117.** Oak Ridge National Lab., TN (United States). Dec 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009394. Source: OSTI; NTIS; GPO Dep.

This document represents a Site-specific Standard Request for underground storage tanks (USTs) 1219-U,1222-U and 2082-U previously located at former Building 9754-1, and tank 2086-U previously located at Building 9720-15, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. The tanks previously contained petroleum products. For the purposes of this report, the two building sites will be regarded as a single UST site and will be referred to as the Rust Garage Facility. The current land use associated with the Y-12 Plant is light industrial and the operational period of the plant is projected to be at least 30 years. Thus, potential future residential

exposures are not expected to occur for at least 30 years. Based on the degradation coefficient for benzene (the only carcinogenic petroleum constituent detected in soils or groundwater at the Rust Garage Facility), it is expected that the benzene and other contaminants at the site will likely be reduced prior to expiration of the 30-year plant operational period. As the original sources of petroleum contamination have been removed, and the area of petroleum contamination is limited, a site-specific standard is therefore being requested for the Rust Garage Facility.

16575 (Y/SUB–94-99069C/Y15/12) **Site status monitoring report for underground storage tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility, Buildings 9720-15 and 9754-1, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, Facility ID No. 0-010117.** Oak Ridge National Lab., TN (United States). Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009039. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide hydrogeologic, geochemical, and vapor monitoring data required for site status monitoring of underground storage tanks (UST) 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility. Comprehensive monitoring was conducted at the site in May 1994 as part of a Monitoring Only program approved by Tennessee Department of Environment and Conservation (TDEC) based on review and approval of Site Ranking. This document presents the results of the first semiannual site status monitoring, which was conducted in September 1994. Site status monitoring and preparation of this report have been conducted in accordance with the requirements of the TDEC Rule 1200-1-15, the TDEC UST Reference Handbook, Second Edition, and direction from TDEC. This document is organized into three sections. Section 1 presents introductory information relative to the site including regulatory initiative and a site description. Section 2 includes the results of sampling of monitoring wells GW-508, GW-631, GW-632, and GW-634. Section 3 presents data from vapor monitoring conducted in subsurface utilities present at the site.

16576 (Y/SUB–94-EAQ10C/4) **Sampling and analysis plan for groundwater and surface water monitoring at the Y-12 Plant during calendar year 1995.** Oak Ridge Y-12 Plant, TN (United States); HSW Environmental Consultants, Inc., Oak Ridge, TN (United States). Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009065. Source: OSTI; NTIS; INIS; GPO Dep.

This plan provides a description of the groundwater and surface-water quality monitoring activities planned for calendar year (CY) 1995 at the Department of Energy Y-12 Plant. Included in this plan are the monitoring activities managed by the Y-12 Plant Health, Safety, Environment, and Accountability (HSEA) Organization through the Y-12 Plant Groundwater Protection Program (GWPP). Other groundwater and surface water monitoring activities (e.g. selected Environmental Restoration Program activities, National Pollution Discharge Elimination System (NPDES) monitoring) not managed through the Y-12 Plant GWPP are not addressed in this report. Several monitoring programs will be implemented in three hydrogeologic regimes: the Bear Creek Hydrogeologic Regime (Bear Creek Regime), the Upper East Fork Poplar Creek Hydrogeologic Regime (East Fork Regime), and the Chestnut Ridge Hydrogeologic Regime (Chestnut Ridge Regime). The Bear Creek and East Fork regimes are located within Bear Creek Valley, and the Chestnut Ridge Regime is located south of the Y-12 Plant. For various reasons, modifications to the 1995 monitoring programs may be necessary during implementation. For example, changes in regulatory requirements may alter the parameters specified for selected wells, or wells could be added to or deleted from the monitoring network. All modifications to the monitoring programs will be approved by the Y-12 Plant GWPP manager and documented as addenda to this sampling and analysis plan.

16577 (Y/TS–1001) **Chemical characteristics of waters in Karst Formations at the Oak Ridge Y-12 Plant.** Shevenell, L.A. (Univ. of Nevada, Reno, NV (United States). Nevada Bureau of Mines and Geology). Oak Ridge National Lab., TN (United States). Nov 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009405. Source: OSTI; NTIS; INIS; GPO Dep.

Several waste disposal sites are located adjacent to or on a karst aquifer composed of the Cambrian Maynardville Limestone (Cmn) and the Cambrian Copper Ridge Dolomite (Ccr) at the U.S. Department of Energy Oak Ridge Y-12 Plant in Oak Ridge, TN. Highly variable chemical characteristics (i.e., hardness) can indicate that the portion of the aquifer tapped by a particular well is subject to a significant quick-flow component where recharge to the system is rapid and water levels and water quality change rapidly in response to precipitation events. Water zones in wells at the Y-12 Plant that exhibit quick-flow behavior (i.e., high hydraulic conductivity) are identified based on their geochemical characteristics and variability in geochemical parameters, and observations made during drilling of the wells. The chemical data used in this study consist of between one and 20 chemical analyses for each of 102 wells and multipart monitoring zones. Of these 102 water zones, 10 were consistently undersaturated with respect to calcite suggesting active dissolution. Repeat sampling of water zones shows that both supersaturation and undersaturation with respect to dolomite occurs in 46 water zones. Twelve of the zones had partial pressure of CO_2 near atmospheric values suggesting limited interaction between recharge waters and the gases and solids in the vadose zone and aquifer, and hence, relatively short residence times. The preliminary data suggest that the Cmn is composed of a complicated network of interconnected, perhaps anastomosing, cavities. The degree of interconnection between the identified cavities is yet to be determined, although it is expected that there is a significant vertical and lateral interconnection between the cavities located at shallow depths in the Cnm throughout Bear Creek Valley and the Y-12 Plant area.

16578 (Y/TS–1264) **Insights into quick flow in a karst aquifer: Usefulness of infrequently collected geochemical data from wells.** Shevenell, L.A. (Univ. of Nevada, Reno, NV (United States). Nevada Bureau of Mines and Geology). Oak Ridge National Lab., TN (United States). Nov 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009058. Source: OSTI; NTIS; GPO Dep.

Highly variable chemical characteristics (e.g., hardness) can indicate that a portion of a karst aquifer sampled by a well is subject to a quickflow component where water flow is rapid and water quality changes rapidly in response to precipitation events. Typically, karst aquifer monitoring for both water level and geochemistry is conducted at frequent intervals (hourly, daily) due to the nature of rapid geochemical and hydrologic changes in association with storm events. Quarterly monitoring data are available at the U.S. Department of Energy Oak Ridge Y- 12 Plant in Oak Ridge, TN, and these data are evaluated to identify quickflow portions of the aquifer. Values of P_{CO_2} near atmospheric suggest rapid recharge of fluids, and 12 of 99 well waters exhibited P_{CO_2} near atmospheric. Waters saturated with respect to dolomite must have relatively long residence times because attainment of saturation requires tens to hundreds of years. Repeat sampling of waters shows that both supersaturation and undersaturation with respect to dolomite occurs in 46 wells, indicating that relatively old waters diffusing from the rock matrix into conduits during baseflow experience periodic flushing by more rapidly recharged waters. Undersaturation with respect to calcite indicates active dissolution and may suggest short residence times because calcite saturation can be expected to occur on the order of days. Evaluation of a_{Mg}/a_{Ca} ratios in the waters allows identification of portions of the aquifer where flow occurs from a dolomite to a limestone, and vice versa. In addition, 30 well waters exhibited coefficients of variation of hardness >10%. Hence, quickflow was identified in association with numerous well waters even though only quarterly monitoring data were available.

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Refer also to citation(s) 14988, 14992, 15141, 15145, 15280, 16173, 16490, 16502, 16531, 16532, 16533, 16539, 16629, 16704

16579 (ENEA-RT-AMB–92-21) **Hydrogeological research in Comacchio valleys.** Barilli, L. (ENEA, Bologna (Italy). Area Energia Ambiente e Salute); Lenzi, G.; Mazzone, N.; Moretti, L.; Olivieri, P.; Tesini, E.; Valpreda, E.M.; Vincenzi, D.; Anselmi, B.; Bucci, M.; Paris, P.; Quercia, F. ENEA, Bologna (Italy). Area Energia Ambiente e Salute. Dec 1992. 67p. (In Italian). (RT/AMB–92-21). Order Number DE95771050. Source: OSTI; NTIS (US Sales Only).

This work deals with the analysis of seepage through the Comacchio wetland, the phreatic aquifer and the neighbouring drainage canals over an area of 400 km^2. To this aim, a monitoring network of 76 wells and 50 piezometers to measure hydraulic head, conductivity and ph of groundwater was positioned. Over this network ten field-surveys were carried out, from december 1988 to november 1990. On the basis of elaborated data and of the simulation produced by grounwater mathematical model, it was verified that: the Comacchio water body exchanges little quantities of water with the phreatic aquifer and with its neighbouring canals, with respect to its total volume; the amount of seepage between canals and phreatic aquifer in the drained area is quite relevant, as confirmed in the hydrological balance; the combined effect of the artificial drainage of the reclaimed terrains and of seepage of the saltwater from the Comacchio wetland to the near terrains leads to the growth of the groundwater salinity with damage to the crops; the calibrated model reproduced with a good approximation the observed groundwater levels; this result may represent a useful support to water quality studies that may be carried out in the future.

16580 (ENEA-RT-AMB–94-26) **Removal of ammonia from wastewaters by natural zeolites as ion exchanging.** Fabiani, C. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Rosati, A.; Pande, D.R.; Ruscio, F. ENEA, Casaccia (Italy). Area Energia Ambiente e Salute. Dec 1994. 18p. (In Italian). (RT/AMB–94-26). Order Number DE95771022. Source: OSTI; NTIS (US Sales Only).

The use of zeolites as ion exchanging or adsorbing materials for the wastewaters, polluted waters and gas mixtures is an up to date research field in environmental technologies. The performances of a naturally occuring zeolite, the neapolitan yellow stuff (NYT), are examined with the purpose of using this material to remove ammonia from wastewaters. The considered wastewaters are produced as a filtrate when sludges of a anaerobic biological treatment plant are dewatered in a filterpress unit. These wastewaters, which have a very high ammonia content, could be recycled in the plant if the ammonia concentration could be reduced to prevent inhibition of the microorganisms activity.

16581 (FEMP/SUB–080) **Electrofishing survey of the Great Miami River, September 1994 Annual Report.** Stocker, L.E. (Univ. of Cincinatti, OH (United States). Dept. of Biological Science); Miller, M.C.; Evans, R.L.; Koch, R.W. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Jan 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. Order Number DE95009020. Source: OSTI; NTIS; INIS; GPO Dep.

Fish sampling by electroshocking in the Great Miami River upstream and downstream the Fernald site (September 25 and 26, 1994) was designed to determine changes in the health of the fish community compared to the previous ten years and to collect samples for uranium analyses in fish fillets. Samples of 853 fish, from 27 species, eight families and three sites at river mile (RM) 38, RM 24, and RM 19 provided seventy-eight samples for uranium analyses by an independent laboratory. The biomass of fish caught per hour was greatest at RM 24 > RM 19 > RM 3 8. The diversity index and the heaviest fish community was RM 24 > RM 38 > RM 19. The pooled site at RM 38 near Hamilton was diagnostically separated from the other sites by the young-of-the-year (YOY) golden redhorse, smallmouth bass and golden shiner. The darns at Hamilton acted as an effective barrier against fish migration upriver. Larger freshwater drum, gizzard shad, channel catfish and flathead catfish, which might be expected in rapid current reaches of mid-sized rivers characterize RM 24. The pool at RM 19 was distinguished from the others by YOY gizzard shad, bluegill, and longear sunfish. Thus the fish community in 1994 was separated ecologically by the physical features of the habitat more than by water quality differences between sites. These data suggest that the Fernald effluents in September were having no detectable effects on the distribution of fishes, independent of changes in habitat quality separated on physical attributes of the river channel at each site.

16582 (GTK-YST–85, pp. 89-97) **Uranium in surficial deposits and waters at Palmottu.** Ahonen, L. (Geological Survey of Finland, Espoo (Finland)); Blomqvist, R.; Ervanne, H.; Suksi, J.; Jaakkola, T. Geological Survey of Finland, Espoo (Finland). 1994. In *The Palmottu Analogue Project, Progress Report 1993. The behaviour of natural radionuclides in and around uranium deposits, Nr. 7.* 97p. Order Number DE95628645. Source: OSTI; NTIS; INIS.

Occurrence of uranium in surficial formations in the vicinity of an underground U deposit was studied. Several water samples from the Lake Palmottu and nearby springs, three lake sediment cores and three peat cores were collected for the study. Uranium concentrations in the water samples varied from 1.4 to 6.9 mBq/l, reflecting the average concentration of near-surface waters in Finland. In some samples, however, the $^{234}U/^{238}U$ activity ratio and water chemistry suggest a partial mixing with deeper groundwaters. In the lake sediments, uranium concentrations increases from 53 Bq/kg in surface layer to five fold in the bottom layers deposited 9000 years ago. In peat cores large variations in uranium concentrations can be observed: from tens of Bq/kg to over 20 kBq/kg of peat ash. The large variation also in the $^{234}U/^{238}U$ activity ratio, from 0.79 to l.91, tends to indicate uranium migration to the peat from more than one uranium source. (orig.) (19 refs., 5 figs., 1 tab.).

16583 (GTK-YST–87) **Hydraulic measurements at Palmottu in 1994.** Ahonen, L.; Lampinen, P. Geological Survey of Finland, Espoo (Finland). 1995. 38p. (In Finnish). Order Number DE95628660. Source: OSTI; NTIS; INIS.

The report describes the results of hydraulic measurements carried out during 1994 at the Palmottu site, Nummi-Pusula. The purpose of the work was to study the hydraulic conductivity and its variation in fractured crystalline bedrock and, consequently, to adjust and ascertain the preliminary hydrogeological model, which was based on earlier geophysical, structural, and hydrogeological studies. The following hydrogeological measurements were done: (1) Slug-tests were made in one drill hole using a double-packer device. The method allows the hydraulic conductivity of the bedrock at a certain depth interval of a drill hole to be measured. (2) Spinner-measurements were made in five drill holes, together with monitoring of water-tables in surrounding drill holes. By this method, the most important hydraulic conductors penetrated by a drill hole were found. Contemporaneous monitoring of the surrounding drill holes gave information on the possible hydraulic connections between drill holes. (3) Water-loss tests were made during drilling of a new hole when intensively fractured sections were observed, and hydraulic conductivity of the sections were estimated. (6 refs., 19 figs., 3 tabs.).

16584 (INIS-mf–14523) **Application of the nuclear gages in dynamic sedimentology for the solid transport study.** Lamdasni, Y. Centre National de l'Energie, des Sciences et des Techniques Nucleaires (CNESTEN), Rabat (Morocco). Feb 1994. 61p. (In French). Order Number DE95627765. Source: OSTI; NTIS (US Sales Only); INIS.

The problems caused by the solid particle transport in rivers, dams, harbors, estuaries and in navigation channels have considerable economical consequences. The technical difficulties met when trying to limit or manage these problems are very important because of lack of knowledge. The nuclear gages and the radioactive tracers can be the measurement and monitoring means which, associated to the conventional techniques, permit to develop strongly the knowledge in the solid transport field. This report gives the modes of solid transport and the problems caused by these transports and exposes the physical properties of the fine sediments and their behavior under the hydrodynamic effects. In the same way, it deals with the theory of the nuclear gages, often applied in dynamic sedimentology and gives some examples of their applications. 29 refs., 35 figs., 5 tabs. (F.M.).

16585 (LUNBDS-NBKE–95-1007) **Methyl mercury in lakes. Factors affecting its production and partitioning between water**

and sediment. Regnell, O. Lund Univ. (Sweden). Dept. of Ecology. Mar 1995. 122p. Order Number DE95766669. Source: OSTI; NTIS.

Radio-labelled inorganic Hg^{2+}(^{203}Hg) was added to the water of microcosms containing lake sediment and water. Anaerobic incubation always resulted in concentrations of radio-labelled methyl mercury in the water at least one order of magnitude higher than did aerobic incubation. This was explained by both Hg methylation activity and release of Hg from sediment under anaerobic conditions. Determination of phospholipid fatty acids (PFLAs) in sediment from a lake polluted with Hg and cellulose fibers, revealed a strong correlation between the concentration of the Methyl-branched fatty acid 10Me16:0 and Hg methylation. This PLFA is characteristic of Desulfobacter. There was an equally strong correlation with Cobalamin. These relationships support the idea that Hg methylation in microorganisms is the result of biochemical pathways, involving Methyl Cobalamin, designed to methylate substrates other than Hg^{2+}. A study in a meso-eutrophic lake corroborated most of the results obtained in the microcosm studies. It was found that CH_3Hg was released from sediment to water when the interface was anoxic, whereas an upper, oxidized sediment layer prevented such release. This redox controlled release probably contributed to the inverse relationship between the concentration of CH_3Hg in the sediment surface and in the water. Since the concentration of Manganese in the water showed the same variation as the concentration of CH_3Hg, it was concluded that Manganese (Mn^{4+}) oxides control the water solubility and release of CH_3Hg from sediment to water. Consequently, when Mn-oxides dissolve under anaerobic conditions, due to reduction of Mn^{4+} to Mn^{2+}, CH_3Hg is simultaneously released. The amplitude of change in the total amount of CH_3Hg was 5-10 times larger in the water mass than in the sediment surface (down to 5mm). 84 refs, 5 figs

16586 (NEI-DK–1945) **Atmospheric deposition of nitrogen. The Nation-Wide Danish Monitoring Programme 1993.** Faglig rapport fra DMU, 123. Skov, H.; Hovmand, M.F.; Grundahl, L.; Runge, E.H.; Kemp, K.; Aistrup, W.; Heidam, N.Z. Danmarks Miljoeundersoegelser, Roskilde (Denmark). 1994. 61p. (In Danish). Order Number DE95772347. Source: OSTI; NTIS.

'The Nation-wide Danish Monitoring Programme' assembles information on nutrient input to Danish aquatic systems. Atmospheric nitrogen input to the Danish marine waters is dealt with, focusing on the nitrogen input to the Kattegat and to the Danish straits, sounds and fjords, a total sea surface area of 44,000 km^2. Measurement performed in 1989-90 indicated that atmospheric input accounts for 25%-33% of the total inorganic nitrogen load to the Kattegat and Danish straits. Measurements from 1992/1993 showed that atmospheric deposition accounts for ca. 33% of the inorganic nitrogen input. Wet deposition is sampled at 16 locations, including 7 coastal or island-based, and 6 gas and aerosol monitoring stations. Special attention is given to measurements of gaseous ammonia, nitric acid and the ammonium and nitrate contents of aerosols and precipitation. In 1993 the sum of the wet and dry deposition to the Kattegat was 0.80 tonnes nitrogen per km^2, the deposition to the Belts and western part of the Baltic Sea is 1.2 tonnes nitrogen per km^2. Total deposition load of nitrogen to the inner seas (44,000 km^2) is ca. 41,000 ton N in 1993 and ca. 90% of total deposition is wet deposition. Dry deposition of nitrogen contributes a minor part of total deposition. Daily measurements of gases and aerosols during 1989/1993 reveal long-range transport of most pollutants, with the exception of ammonia and ammonium. These components have Danish agricultural sources. Agriculture appears to be the most important source of nitrogen pollution. (AB) (15 refs.)

16587 (NIRS-R–25, pp. 10-13) **Concentration of technetium-99 in marine environment.** Hirano, Shigeki (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Seawater and brown algae have been collected along the coast of Ibaraki Prefecture. Technetium-99 was preconcentrated from seawater by anion exchange resin, Bio-rad AG1-X8, C1-form, 50-100 mesh, and was extracted by 30% tri-n-octylamine (TOA) : xylene solution, followed by back-extraction with 5MNaOH solution. Technetium-99 was re-extracted into 2-butanone which was removed by rotary evaporator. The residue was dissolved in diluted sulfuric acid solution, in which 20mg of cupric ion was added. Technetium-99 was co-precipitated with cupric ion carrier as TcS by adding a thioacetamide solution. Algae were dried and ignited in an electric furnace at 450degC for 36h. The ash were digested with 4N nitric acid solution on a hot plate to leach technetium-99 into the nitric acid solution. The solution was centrifuged and the supernatant was processed by liquid extraction with 30% TOA-xylene solution as in the analysis of seawater. Among several species of brown algae, the highest concentration of technetium-99 was obtained in Sargassum thunbergii, which was found to be a useful indicator of technetium-99 in marine environment. (author).

16588 (ORNL/CDIAC–75) **Carbon dioxide concentrations in surface water and the atmosphere during 1986–1989 NOAA/PMEL cruises in the Pacific and Indian Oceans.** Murphy, P.P. (National Oceanic and Atmospheric Administration, Seattle, WA (United States). Pacific Marine Environmental Lab.); Kelly, K.C.; Feely, R.A.; Gammon, R.H.; Kozyr, A. Oak Ridge National Lab., TN (United States). Jan 1995. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (NDP–047). Order Number DE95009659. Source: OSTI; NTIS; GPO Dep.

Environmental Sciences Division Publication No. 4349.

The carbonate system in seawater is one of the most complex and important topics in oceanography. The system has long interested many oceanographers from various fields because it plays a major role in all three subspheres of the earth (biosphere, lithosphere, and hydrosphere). Carbon dioxide is a soluble gas that dissolves in sea water. As a result, the oceans are a potential sink for the CO_2, produced by the burning of fossil fuels, and we seek to understand the role of the World Ocean in regulating atmospheric levels of CO_2. With refined determinations for the various dissociation constants of carbonic and boric acids in seawater and the advances in sophisticated instrumentation for measuring the carbonate parameters, our knowledge of the CO_2-carbonate system of the ocean has rapidly increased. Extensive oceanographic investigations have been carried out in the World Ocean. Those extensive studies, especially in physical oceanography, have provided an excellent foundation for other types of study, such as that of the CO_2-carbonate system. This document presents the results of quasi-continuously measured CO_2 concentrations in surface water and the atmosphere during 5 Pacific Marine Environmental Laboratory cruises in the Pacific and Indian Oceans.

16589 (PNL-SA–24505) **Abiotic reduction of aquifer materials by dithionite: A promising in-situ remediation technology.** Amonette, J.E. (Pacific Northwest Lab., Richland, WA (United States)); Szecsody, J.E.; Schaef, H.T.; Gorby, Y.A.; Fruchter, J.S.; Templeton, J.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–22: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95007812. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory batch and column experiments were conducted with Hanford sediments to develop the capability to predict (1) the longevity of dithionite in these systems, (2) its efficiency as a reductant of structural iron, and (3) the longevity and reactivity of the reduced iron with soluble inorganic and organic species. After an initial induction period, the loss of dithionite by disproportionation and oxidation could be described by pseudo-first-order (PFO) kinetics. Other than the initial reaction with ferric iron, the primary factor promoting loss of dithionite in this system was disproportion nation via heterogeneous catalysis at mineral surfaces. The efficiency of the reduction of structural iron was nearly 100% for the first fourth of the ferric iron, but declined exponentially with higher degrees of reduction so that 75% of the ferric iron could be reduced. This decrease in reduction efficiency probably was related to differences in the accessibility of ferric iron in the mineral particles, with iron in

clay-sized particles being the most accessible and that in silt- and sand-sized particles less accessible. Flow-through column studies showed that a reduced-sediment barrier created in this manner could maintain a reducing environment.

16590 (SVF–537) **Pre-treatment of surface water for production of make-up water with membrane technology.** Ramsbaeck, B. (AaF-Eneergikonsult Stockholm AB, (Sweden)). Stiftelsen foer Vaermeteknisk Forskning, Stockholm (Sweden). Feb 1995. 69p. (In Swedish). Project Vaermeforsk-K1-101. Order Number DE95766644. Source: OSTI; NTIS.

To demineralize make-up water by using membrane technique, instead of, or in combination with, ion exchange technique becomes more and more common. Equipment for Reverse Osmosis (RO) is an interesting alternative in many applications. An investigation on site with a pilot plant equipment for RO has been accomplished in three industrial plants. The waters that have been treated in the different plants have varying qualities. One is a lake water, rich in humus, one is a subsoil water and one is a local water with a normal content of sodium but moderate content of humus and silica. The results have shown that the best conditions for operating with RO-equipment are when the incoming water has drinking water quality. Local waters have been very favourable from operating view. Humus rich waters give a strongly contaminated membrane that makes regular washing necessary. A high content of silica in a local water can be taken care of with a good reduction and without noticeable pluggings in the membrane. When producing make-up water for steam plants, softening of the water before the RO-equipment, is recommended. The quality of the produced pearmeat is equivalent in all applications irrespective of the quality of the incoming water. Sodium-, humus- and silica content is reduced with a specific percentage of the content in the raw- and the pure water. The reduction is mostly 95-99%. 6 figs, 11 tabs

16591 (UCRL-ID–120471) **Retardation of volatile organic compounds in ground water in low organic carbon sediments.** Hoffman, F. Lawrence Livermore National Lab., CA (United States). Apr 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009541. Source: OSTI; NTIS; INIS; GPO Dep.

It is postulated that adsorption onto aquifer matrix surfaces is only one of the processes that retard contaminants in ground water in unconsolidated sediments; others include hydrodynamic dispersion, abiotic/biotic degradation, matrix diffusion, partitioning to organic carbon, diffusion into and retention in dead-end pores, etc. This work aims at these processes in defining the K_d of VOCs in sediments with low organic carbon content. Experiments performed include an initial column experiment for VOC (TCE and perchloroethylene(PCE)) retardation tests on geological materials, PCE and TCE data from LLNL sediments, and a preliminary multilayer sampler experiment. The VOC K_ds in low organic carbon permeable aquifer materials are dependent on the VOC composition and independent of aquifer grain size, indicating that sorption was not operative and that the primary retarding factors are diffusion controlled. The program of future experiments is described.

16592 (UCRL-JC–120466) **A methodology for assessing the impact of mutagens on aquatic ecosystems. Final report.** Knezovich, J.P.; Martinelli, R.E. Lawrence Livermore National Lab., CA (United States). Mar 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9408227–1: 45. annual American Institute of Biological Sciences (AIBS) meeting, Knoxville, TN (United States), 7-11 Aug 1994). Order Number DE95009044. Source: OSTI; NTIS; INIS; GPO Dep.

Assessments of impacts of hazardous agents (i.e., chemical and physical mutagens) on human health have focused on defining the effects of chronic exposure on individuals, with cancer being the main effect of concern. In contrast, impacts on ecosystems have traditionally been gauged by the assessment of near-term organism mortality, which is clearly not a useful endpoint for assessing the long-term effects of chronic exposures. Impacts on individual organisms that affect the long-term survival of populations are much more important but are also more difficult to define. Therefore, methods that provide accurate measures of sub-lethal effects that are linked to population survival are required so that accurate assessments of environmental damage can be made and remediation efforts, if required, can be initiated. Radioactive substances have entered aquatic environments as a result of research and production activities, intentional disposal, and accidental discharges. At several DOE sites, surface waters and sediments are contaminated with radioactive and mutagenic materials. The accident at the Chernobyl power station in the former Soviet Union (FSU) has resulted in the contamination of biota present in the Kiev Reservoir. This documents presents a methodology which addresses the effects of a direct-acting mutagen (radiation) on aquantic organisms by applying sensitive techniques for assessing damage to genetic material.

16593 (VTT-PUB–184) **Modeling flow in fractured medium. Uncertainty analysis with stochastic continuum approach.** Niemi, A. (VTT Communities and Infrastructure, Espoo (Finland)). Technical Research Centre of Finland, Espoo (Finland); Helsinki Univ. of Technology, Espoo (Finland). 1994. 201p. Order Number DE95628661. Source: OSTI; NTIS; INIS.

For modeling groundwater flow in formation-scale fractured media, no general method exists for scaling the highly heterogeneous hydraulic conductivity data to model parameters. The deterministic approach is limited in representing the heterogeneity of a medium and the application of fracture network models has both conceptual and practical limitations as far as site-scale studies are concerned. The study investigates the applicability of stochastic continuum modeling at the scale of data support. No scaling of the field data is involved, and the original variability is preserved throughout the modeling. Contributions of various aspects to the total uncertainty in the modeling prediction can also be determined with this approach. Data from five crystalline rock sites in Finland are analyzed. (107 refs., 63 figs., 7 tabs.).

16594 (YJT–94-04) **Groundwater flow analyses in preliminary site investigations. Modelling strategy and computer codes.** Taivassalo, V. (VTT Energy, Espoo (Finland)); Koskinen, L.; Meling, K. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Feb 1994. 97p. Order Number DE95626548. Source: OSTI; NTIS; INIS.

The analyses of groundwater flow comprised a part of the preliminary site investigations which were carried out by Teollisuuden Voima Oy (TVO) for five areas in Finland during 1987 -1992. The main objective of the flow analyses was to characterize groundwater flow at the sites. The flow simulations were also used to identify and study uncertainties and inadequacies which are inherent in the results of earlier modelling phases. The flow analyses were performed for flow conditions similar to the present conditions. The modelling approach was based on the concept of an equivalent continuum. Each fracture zone and the rock matrix among the zones was, however, considered separately as a hydrogeologic unit. The numerical calculations were carried out with a computer code package, FEFLOW. The code is based upon the finite element method. With the code two- and one-dimensional elements can also be used by way of embedding them in a three-dimensional element mesh. A set of new algorithms was developed and employed to create element meshes for FEFLOW. The most useful program in the preliminary site investigations was PAAWI, which adds two-dimensional elements for fracture zones to an existing three-dimensional element mesh. The new algorithms reduced significantly the time required to create spatial discretization for complex geometries. Three element meshes were created for each site. The boundaries of the regional models coincide with those of the flow models. (55 refs., 40 figs., 1 tab.).

16595 (YJT–94-18) **Numerical study on the effects of the alternative structure geometries on the groundwater flow at the Romuvaara site.** Koskinen, L. (VTT Energy, Espoo (Finland)); Meling, K. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Nov 1994. 57p. Order Number DE95626549. Source: OSTI; NTIS; INIS.

The work has two aims. Firstly, it completes the numerical modelling work for the groundwater flow at the Romuvaara site in Finland performed during the preliminary site investigations by varying geometries of the most significant fracture zones. The modified fracture zone geometries are selected within the uncertainties of the structure of the bedrock model. Secondly, the work

studies the effects of several potential fracture zones. The locations and geometries of these zones are decided in such a way that either they offer potential or alternative hydrogeologic connections that would explain the anomalies in the results of the earlier field investigations or their existence has been implied by geophysical studies. The field results comprise the measured hydraulic head values under the natural conditions in boreholes KR1 -KRS, and the hydraulic head responses in the pumping test. The work employs the calibrated flow model developed in the preliminary site investigations as the base case, that is modified to correspond to the alternative geometries. Before the simulations with the alternative geometries, the boundary condition for the top of the flow model is partly changed in this work in order to revoke the modification motivated by incorrect field data that were used in the calibration of the flow model. (25 refs., 27 figs., 1 tab.).

16596 (YJT–94-19) **WELL-94: a stylized well scenario for indicative dose assessment of deep repositories.** Vieno, T. (VTT Energy, Espoo (Finland)). Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Dec 1994. 15p. Order Number DE95626536. Source: OSTI; NTIS; INIS.

WELL-94 is a stylized well scenario aimed to be used as an indicator in assessing the performance of the near-field and geosphere barriers of a deep repository for nuclear waste. It converts the release rates of radionuclides from the repository into the geosphere or from the geosphere into the biosphere into a dose rate. The scenario is based on an assumption that the annual releases from the repository into the biosphere are diluted in 100 000 m^3 of water and an individual drinks 500 litres of contaminated water per year. Drinking of water is the only exposure pathway considered. (12 refs., 4 tabs.).

55 BIOMEDICAL SCIENCES, BASIC STUDIES

16597 (DOE/ER/25054–T2) **A broad research program on the sciences of complexity. Final report.** Santa Fe Inst., NM (United States). [1994]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER25054. Order Number DE95010178. Source: OSTI; NTIS; GPO Dep.

This report provides a summary of many of the research projects completed by the Santa Fe Institute (SFI) during the period January 1 to May 15, 1994. These research efforts continue to focus on two general areas: the study of, and search for, underlying scientific principles governing complex adaptive systems, and the exploration of new theories of computation that incorporate natural mechanisms of adaptation (mutation, genetics, evolution).

16598 (DOE/ER/25054–T3) **1993 Annual report on scientific programs: A broad research program on the sciences of complexity.** Santa Fe Inst., NM (United States). [1993]. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER25054. Order Number DE95010179. Source: OSTI; NTIS; GPO Dep.

This report provides a summary of many of the research projects completed by the Santa Fe Institute (SFI) during 1993. These research efforts continue to focus on two general areas: the study of, and search for, underlying scientific principles governing complex adaptive systems, and the exploration of new theories of computation that incorporate natural mechanisms of adaptation (mutation, genetics, evolution).

5502 Biochemistry

Refer also to citation(s) 16664, 16709

16599 (CONF-941241–Absts.) **Prediction method abstracts.** Lawrence Livermore National Lab., CA (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. From Critial assessment of techniques for protein structure prediction; Asilomar, CA (United States); 4-8 Dec 1994. Order Number DE95009628. Source: OSTI; NTIS; GPO Dep.

This conference was held December 4–8, 1994 in Asilomar, California. The purpose of this meeting was to provide a forum for exchange of state-of-the-art information concerning the prediction of protein structure. Attention if focused on the following: comparative modeling; sequence to fold assignment; and ab initio folding.

16600 (CONF-950226–30) **Optical melting as a tool for optimizing SBH analysis of DNA.** Doktycz, M.J. (Oak Ridge National Lab., TN (United States)); Jacobson, K.B.; Foote, R.S.; Beattie, K.L. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States);National Insts. of Health, Bethesda, MD (United States). DOE Contract AC05-84OR21400. Grant 1 P20 HG00666. From SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995. Order Number DE95009032. Source: OSTI; NTIS; GPO Dep.

Sequencing by hybridization is a technique that relies on the specific hybridization properties of nucleic acids to derive sequence information. Hybridization properties are highly dependent on the DNA sequence and the solution environment. Identification of the optimal SBH conditions can be obtained by optical melting. By optical melting of 128 octamer pairs that have the appropriate choice of nucleic acid structures, a useful model of stability has been obtained which will aid in the design and implementation of SBH assays.

16601 (DOE/ER/20044–T2) **Role of pectolytic enzymes in the programmed separation of cells from the root cap of higher plants. Final report.** Hawes, M.C. Arizona Univ., Tucson, AZ (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER20044. Order Number DE95008630. Source: OSTI; NTIS; GPO Dep.

The objective of this research was to develop a model system to study border cell separation in transgenic pea roots. In addition, the hypothesis that genes encoding pectolytic enzymes in the root cap play a role in the programmed separation of root border cells from the root tip was tested. The following objectives have been accomplished: (1) the use of transgenic hairy roots to study border cell separation has been optimized for Pisum sativum; (2) a cDNA encoding a root cap pectinmethylesterase (PME) has been cloned; (3) PME and polygalacturonase activities in cell walls of the root cap have been characterized and shown to be correlated with border cell separation. A fusion gene encoding pectate lyase has also been transformed into pea hairy root cells.

16602 (LBL–36333) **Low density lipoprotein subclasses and response to a low-fat diet in healthy men.** Krauss, R.M. (Lawrence Berkeley Lab., CA (United States). Life Sciences Div.); Dreon, D.M. Lawrence Berkeley Lab., CA (United States). Nov 1994. 38p. Sponsored by USDOE, Washington, DC (United States);National Insts. of Health, Bethesda, MD (United States);National Dairy Council, Rosemont, IL (United States). DOE Contract AC03-76SF00098. Grant HL 18574. (CONF-9404251–1: Federation of Americal Societies for Experimental Biology (FASEB) symposium, Anaheim, CA (United States), 24-28 Apr 1994). Order Number DE95008497. Source: OSTI; NTIS; GPO Dep.

Lipid and lipoprotein response to reduced dietary fat intake was investigated in relation to differences in distribution of LDL subclasses among 105 healthy men consuming high-fat (46%) and low-fat (24%) diets in random order for six weeks each. On high-fat, 87 subjects had predominantly large, buoyant LDL as measured by gradient gel electrophoresis and confirmed by analytic ultracentrifugation (pattern A), while the remainder had primarily smaller, denser LDL (pattern B). On low-fat, 36 men changed from pattern A to B. Compared with the 51 men in the stable A group, men in the stable B group (n = 18) had a three-fold greater reduction in LDL cholesterol and significantly greater reductions in plasma apoB and mass of intermediate (LDL II) and small (LDL III) LDL subtractions measured by analytic ultracentrifugation. In both stable A and change groups, reductions in LDL-cholesterol were not accompanied by reduced plasma apoB, consistent with the observation of a shift in LDL particle mass from larger, lipid-enriched (LDL I and II) to smaller, lipid-depleted (LDL III and IV) subfractions, without significant change in particle number. Genetic and environmental factors influencing LDL subclass distributions

thus may also contribute substantially to interindividual variation in response to a low-fat diet.

5503 Cytology

16603 (IC–94/234) **Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.** International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. 28p. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

The report includes 17 summaries of the papers presented at the Third Trieste Conference on Chemical Evolution concerning the structure and model of the first cell which was the central theme of the conference. A separate indexing is provided for each summary. Refs and figs.

5504 Genetics

Refer also to citation(s) 16664

16604 (CONF-9308255–Absts.) **Seventeenth international congress of genetics. Genetics and the understanding of life: Volume of abstracts.** International Congress of Genetics; National Research Council of Canada, Ottawa, ON (Canada). Aug 1993. 250p. From 17. international congress of genetics :genetics and the understanding of life; Birmingham (United Kingdom); 15-21 Aug 1993. Order Number DE95003214. Source: OSTI; NTIS (US Sales Only); The Quadgraphics Partnership, Thatcham, Berkshire (United Kingdom).

This volume of abstracts represents the main publication of the XVIIth International Congress of Genetics. It contains summaries of: The invited Plenary and symposia papers; abstracts of the Public Awareness presentations; and contributions from delegates. Topics discussed include; genetic engineering and mapping, DNA repair proteins, gene mutations, and gene recombination.

16605 (DOE/ER/10873–T2) **The roles played by mitochondrial DNA and nuclear genes in reversion to fertility in S-Type male-sterile maize. Progress report, April 1, 1985–March 31, 1989.** Laughnan, J.R. Illinois Univ., Urbana, IL (United States). Dept. of Plant Biology. [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-81ER10873. Order Number DE95008638. Source: OSTI; NTIS; GPO Dep.

This is a progress report/renewal request for work of the roles played by mitochondrial DNA and nuclear genes in reversion to fertility in s-type male sterile maize. Information is included for the following major catagories of research on this project: molecular basis for nuclear reversion; molecular characterization of cytoplasmic revertants; nuclear control over cytoplasmic reversion and over replication of S1 and S2; developmental studies; transposition of nuclear restorer elements.

16606 (UCRL-JC–117560) **Three dimensional imaging of DNA fragments during electrophoresis using a confocal detector.** Brewer, L.R.; Davidson, C.; Balch, J.; Carrano, A. Lawrence Livermore National Lab., CA (United States). 30 Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950226–32: SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine, San Jose, CA (United States), 5-10 Feb 1995). Order Number DE95009463. Source: OSTI; NTIS; GPO Dep.

We have measured the three dimensional distribution of DNA fragments within an electrophoretic band. The measurements were made using a confocal microscope and a photon counting photomultiplier detector. A DNA sequencing standard was loaded into glass microchannel plates containing polyacrylamide gel. The measurements were made by scanning the plates in three dimensions using a mechanical stage under computer control, while electrophoresis was taking place. We found that the distribution of DNA was the same for all the bands measured in the sequencing ladder with an approximate Gaussian distribution along all three axes. These measurements are important to understand what physical forces shape electrophoretic bands confined by a channel and also to aid in the design of high throughput DNA sequencers.

5505 Metabolism

Refer also to citation(s) 16581

5506 Medicine

Refer also to citation(s) 16126, 16208, 16209, 16211, 16212, 16214, 16215, 16217, 16218, 16220, 16222, 16223, 16224, 16225, 16226, 16227, 16228, 16229, 16230, 16231, 16232, 16233, 16234, 16235, 16236, 16237, 16337, 16338, 16339, 16341, 16367, 16368, 16369, 16370, 16371, 16372, 16616, 16664, 16694, 16871, 16872

16607 (BNL–61149, pp. 319-322) **Application of an industrial robot to nuclear pharmacy.** Viola, J. (Univ. of Michigan, Ann Arbor, MI (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry*. 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Increased patient throughput and lengthened P.E.T. scan protocols have increased the radiation dose received by P.E.T. technologists. Automated methods of tracer infusion and blood sampling have been introduced to reduce direct contact with the radioisotopes, but significant radiation exposure still exists during the receipt and dispensing of the patient dose. To address this situation the authors have developed an automated robotic system which performs these tasks, thus limiting the physical contact between operator and radioisotope.

16608 (DOE/ER/60460–T4) **Harvard-MIT research program in short-lived radiopharmaceuticals. Final report.** Adelstein, S.J. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Office of Sponsored Programs). Massachusetts Inst. of Tech., Cambridge, MA (United States). Feb 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER60460 ; FG02-87ER60526. Order Number DE95009691. Source: OSTI; NTIS; INIS; GPO Dep.

The Harvard-MIT Research Program in Short-lived Radiopharmaceuticals was established in 1977 to foster interaction among groups working in radiopharmaceutical chemistry at Harvard Medical School, the Massachusetts Institute of Technology, and the Massachusetts General Hospital. To this was added a group at The Childrens Hospital. From these collaborations and building upon the special strengths of the participating individuals, laboratories and institutions, it was hoped that original approaches would be found for the design of new, clinically useful, radiolabeled compounds. The original thrust of this proposal included: (a) examination of the coordination chemistry of technetium as a basis for rational radiopharmaceutical design, (b) development of an ultrashort-lived radionuclide generator for the diagnosis of congenital heart disease in newborns, (c) synthesis of receptor-site-directed halopharmaceuticals, (d) improved facile labeling of complex molecules with positron-emitting radionuclides. The authors' 1986 proposal was oriented toward organs and disease, emphasizing radiolabeled agents that delineate specific functions and the distribution of receptors in brain, heart, and tumors. In 1989, they further refined their purposes and focused on two major aims: (a) synthesis and utilization of neutral technetium and rhenium complexes of high specific activity, and (b) development of new approaches to the radiolabeling of proteins, peptides, immunoglobulins, and their fragments. In 1992, the authors amended this proposal to concentrate their efforts on biologically active peptides and proteins for targeted radiodiagnosis and therapy.

16609 (DOE/ER/61704–1) **Frontiers in nuclear medicine symposium: Nuclear medicine & molecular biology.** American

Coll. of Nuclear Physicians, Washington, DC (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER61704. (CONF-9309482–Absts.: Frontiers in nuclear medicine symposium: nuclear medicine and molecular biology, Washington, DC (United States), 9-12 Sep 1993). Order Number DE95009681. Source: OSTI; NTIS; GPO Dep.

This document contains the abstracts from the American College of Nuclear Physicians 1993 Fall Meeting entitled, 'Frontiers in Nuclear Medicine Symposium: Nuclear Medicine and Molecular Biology'. This meeting was sponsored by the US DOE, Office of Health and Environmental Research, Office of Energy Research. The program chairman was Richard C. Reba, M.D.

16610 (INIS-BR–3481) **Study of air cavities influence in head and neck radiotherapy with 10 MV photon beam.** Souza, C.N. de. Pernambuco Univ., Recife, PE (Brazil). Dept. de Energia Nuclear. Mar 1989. 73p. (In Portuguese). Order Number DE95626721. Source: OSTI; NTIS (US Sales Only); INIS.

PRONUCLEAR. Tese de Mestrado, 47.

This is a study about dose distribution in the larynx region under irradiation with a 10 MV photon beam. This localization presents air cavities, that can compromise the dose at air-tissue interfaces by electronic equilibrium loss and backscattering lack. For this study, a parallel ionization chamber was used in the air cavities simulated with a perspex phantom. The influence of the air cavities in the proximal, distal and lateral interfaces was analysed. The results showed a expressive loss of dose at the air-tissue interface. For typical irradiation field and anatomic cavity, under dose values of 4% in the proximal interface, 11% in the distal interface and 7% in the lateral interface were found. Irradiation field larger than 6 X 6 cm^2 were optimal in reducing the total effect of under dosing at the interface. (author). 39 refs, 23 figs, 12 tabs.

16611 (INIS-mf–14529, pp. 50) **Methods for the localization of ^{106}Ru-applicators in radiation therapy of choroidal melanoma.** Nowotny, R. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Menapace, R. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990*. 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADIOTHERAPY/melanomas; RADIOTHERAPY/uvea; RUTHENIUM 106/radiation sources; BIOMEDICAL RADIOGRAPHY; LIGHT EMITTING DIODES; PMMA; RADIOTHERAPY; MELANOMAS; UVEA; REPLICAS; RETINA

16612 (SAND–95-0672C) **The use of low energy, ion induced nuclear reactions for proton radiotherapy applications.** Horn, K.M. (Sandia National Labs., Albuquerque, NM (United States)); Doyle, B.; Segal, M.N.; Hamm, R.W.; Adler, R.J.; Glatstein, E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950220–5: 9. international conference on ion beam modification of materials, Canberra (Australia), 5-10 Feb 1995). Order Number DE95009859. Source: OSTI; NTIS; INIS; GPO Dep.

Medical radiotherapy has traditionally relied upon the use of external photon beams and internally implanted radioisotopes as the chief means of irradiating tumors. However, advances in accelerator technology and the exploitation of novel means of producing radiation may provide useful alternatives to some current modes of medical radiation delivery with reduced total dose to surrounding healthy tissue, reduced expense, or increased treatment accessibility. This paper will briefly overview currently established modes of radiation therapy, techniques still considered experimental but in clinical use, innovative concepts under study that may enable new forms of treatment or enhance existing ones. The potential role of low energy, ion-induced nuclear reactions in radiotherapy applications is examined specifically for the 650 keV d(^{3}He,p)^{4}He nuclear reaction. This examination will describe the basic physics associated with this reaction's production of 17.4 MeV protons and the processes used to fabricate the necessary materials used in the technique. Calculations of the delivered radiation dose, heat generation, and required exposure times are presented. Experimental data are also presented validating the dose calculations. The design of small, lower cost ion accelerators, as embodied in 'nested'-tandem and radio frequency quadrupole accelerators is examined, as is the potential use of high-output ^{3}He and deuterium ion sources. Finally, potential clinical applications are discussed in terms of the advantages and disadvantages of this technique with respect to current radiotherapy methods and equipment.

16613 (UCRL-JC–118754) **Electron transport in radiotherapy using local-to-global Monte Carlo.** Svatos, M.M. (Lawrence Livermore National Lab., CA (United States)); Chandler, W.P.; Siantar, C.L.H.; Rathkopf, J.A.; Ballinger, C.T.; Neuenschwander, H.; Mackie, T.R.; Reckwerdt, P.J. Lawrence Livermore National Lab., CA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States);National Insts. of Health, Bethesda, MD (United States). DOE Contract W-7405-ENG-48. NIH Grant CA52692. (CONF-950420–22: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 may 1995). Order Number DE95009563. Source: OSTI; NTIS; INIS; GPO Dep.

Local-to-Global (L-G) Monte Carlo methods are a way to make three-dimensional electron transport both fast and accurate relative to other Monte Carlo methods. This is achieved by breaking the simulation into two stages: a local calculation done over small geometries having the size and shape of the "steps" to be taken through the mesh; and a global calculation which relies on a stepping code that samples the stored results of the local calculation. The increase in speed results from taking fewer steps in the global calculation than required by ordinary Monte Carlo codes and by speeding up the calculation per step. The potential for accuracy comes from the ability to use long runs of detailed codes to compile probability distribution functions (PDFs) in the local calculation. Specific examples of successful Local-to-Global algorithms are given.

5530 Agriculture and Food Technology

Refer also to citation(s) 14751

16614 (ENEA-RT-INN–94-44) **In vivo pollination with maize pollen stored in aqueous medium.** Broglia, M. (ENEA, Casaccia (Italy). Area Energia e Innovazione). ENEA, Casaccia (Italy). Area Energia e Innovazione. Nov 1994. 13p. (RT/INN–94-44). Order Number DE95771023. Source: OSTI; NTIS (US Sales Only).

A hypertonic aqueous medium can be used to obtain non-bursting, non-germinating maize (zea mays L.) pollen suspensions, which can be stored at 0_0C preserving pollen viability. This medium could be used in different techniques for maize pollen genetic manipulation, but fertilization ability of such stored pollen has to be proved. In this work, pollen stored in different hypertonic media was used to perform in vivo pollinations by different techniques. Uncut silks and pollen filtered in a paste form were found necessary perequisites for a fruitfull pollen-silk interaction. In the 0.5-1.5 M range a highter sucrose concentration increases storability but decreases fertilization ability. Salts as KNO_3 and $CaCl_2$ were also explored in an osmotic concentration range. Considering that soluble calcium, needful for germination, can be lost from pollen in aqueous media, a hypertonic aqueous medium osmotically balanced in calcium and sucrose contents was tested as storage medium. Pollen stored several hours in this medium produced numerous seed sets; the high variability of the obtained results made evident the crucial role of silk status in successful pollinations.

16615 (IC–94/234, pp. 12) **The occurrence of acritarchs in proterozoic microflora of Brazil.** Rodrigues Subacius, S.M. (Centro de Biotecnologia CEBIQ-FAENQUIL, Sao Paulo (Brazil)). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first*

cell. The Alexander Ivanovich Oparin 100th Anniversary Conference. 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MICROORGANISMS/fossils; BIOLOGICAL EVOLUTION; BRAZIL; MICROORGANISMS; FOSSILS; ORGANIC MATTER; PALEONTOLOGY

16616 (INIS-BR–3486) **Production of double antibody for radioimmunoassay (sheep anti-rabbit IgG antiserum).** Silva, S.R. da. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1993. 177p. (In Portuguese). Order Number DE95626630. Source: OSTI; NTIS (US Sales Only); INIS.

A second antibody (sheep anti-rabbit IgG antiserum) to be used in RIAs in which the first antibody is raised in rabbits was produced. For this production, initially the IgG was isolated from rabbit serum and purified by sodium sulphate precipitation followed by ion exchange chromatography on DEAE-cellulose. Four sheep were immunized with 500 u g of purified rabbit IgG, emulsified in Freund Complete Adjuvant and administered by multisite subcutaneous injections. These injections were repeated at 20-days intervals and blood samples (40 ml) were taken from the jugular vein 10 days after the boosts for the evaluation of the antisera title. After each four boosts a great bleeding was done by the same route. Approximately 500 ml of serum were obtained in each bleeding per animal. The antisera were evaluated by the human thyrotropin RIA developed at IPEN laboratories employing reagents provided by NIDDKD, USA. These evaluations referred to the determination of the antisera title and of the ideal concentration of carrier IgG, to the study of the kinetic of precipitation and to the confirmation of the inexistent cross-reactivity with human IgG, in comparison with a reference antiserum of know precipitation characteristics supplied by the Radioassay System Laboratories. Approximately 3,6 l of antiserum (sheep anti-rabbit IgG serum) were produced from the four sheep, which presented title and precipitation characteristics very similar to those exhibited by the imported commercial product, even presenting higher titles. The results obtained in this work indicated that it was created enough experience for the production of this biological reagent for RIA, that could be done integrally in the country in greater scale, and at a very reduced cost. (author). 81 refs, 36 figs, 33 tabs.

16617 (INIS-mf–14484) **Animal production and health newsletter. No.21.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jan 1995. 22p. Order Number DE95627815. Source: OSTI; NTIS (US Sales Only); INIS.

This newsletter contains brief reports on 7 meetings, workshops and training courses held between september and december 1994, the status of the 6 co-ordinated research programmes organized by the Animal Production and Health Section of the Joint FAO/IAEA Division, recent developments at the Animal Production Unit at the IAEA Laboratory Seibersdorf and a presentation of 5 forthcoming meetings, workshops and training courses.

16618 (INIS-mf–14485) **Soils newsletter. V.17, no.2.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1994. 37p. Order Number DE95627811. Source: OSTI; NTIS (US Sales Only); INIS.

This newsletter contains brief presentations of 8 co-ordinated research programmes and 4 training courses organized by the Soil Fertility, Irrigation and Crop Production Section of the Joint FAO/IAEA division and highlights on the activities on the Technical Cooperation Projects for which the Section is currently responsible in the Middle East and Europe. The following meetings are presented with excerpts from the reports submitted: The third FAO/IAEA Research Coordination Meeting FAO/IAEA CRP on Enhancing Soil Fertility and Crop production by Better Management of Rhizobium held at the University of Geneva between 15-19 August 1994 (24 excerpts), The First FAO/IAEA Research Co-ordination Meeting on "The Use of Nuclear Techniques for Optimizing Fertilizer Applications Under Irrigated Wheat to Increase the Efficient Use of Nitrogen Fertilizers and Consequently Reduce Environmental Pollution" held in Vienna between 3-6 October 1994 (12 excerpts) and Final Research Co-ordination Meeting of the FAO/IAEA/SIDA Coordinated Research Programme on The Use of Isotope Studies on Increasing and Stabilizing Plant Productivity in Low Phosphate and Semi-arid and Sub-humid Soils of the Tropics and Sub-tropics held in Vienna between 10-14 October 1994 (11 excerpts).

16619 (PNL-SA–25858) **Responding to Agenda 2020: A technology vision and research agenda for America's forest, wood and paper industry.** Lang, K.S. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009120. Source: OSTI; NTIS; GPO Dep.

This document presents project summaries that demonstrate specific capabilities of interest to the forest, wood and paper industry in areas where PNL offers significant depth of experience or unique expertise. Though PNL possesses a wide range of capabilities across many of the technology-related issues identified by the industry, this document focuses on capabilities that meet the specific forest, wood and paper industry needs of the following research areas: forest inventory; human and environmental effects; energy and environmental tradeoffs; reduction of impacts of liquid effluent; solid wastes; removal of non-process elements in pulp and paper operations; life cycle assessment; and process measurement and controls. In addition, PNL can provide the forest, wood and paper industry with support in areas such as strategic and program planning, stakeholder communications and outreach, budget defense and quality metrics. These are services PNL provides directly to several programs within DOE.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

Refer also to citation(s) 14958, 15140, 15159, 15168, 15215, 15216, 15593, 15601, 16200, 16286, 16394, 16517, 16587, 16596, 17316, 17317, 17341

16620 (BARC–1994/E/043) **Physical, anatomical, physiological and metabolic data for reference Indian man - a proposal.** Dang, H.S. (Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.); Jaiswal, D.D.; Parameswaran, M.; Krishnamony, S. Bhabha Atomic Research Centre, Bombay (India). 1994. 74p. Order Number DE95627827. Source: OSTI; NTIS (US Sales Only); INIS.

The collation and generation of data on physical, anatomical, physiological and metabolic characteristics of Indian subjects were carried out to set up a Reference Indian Man for radiation protection. A comparison of the Reference Indian Man data with the corresponding data for ICRP Reference Man, clearly showed that the physical, anatomical and metabolic characteristics were in general smaller for Reference Indian Man. A few of the physiological characteristics such as the daily consumption of drinking water, sweat rate were however, found to be higher, and the minute volume was similar for Reference Indian, in comparison to the ICRP Reference Man. The details of various human characteristics representative of the Indian population are reported in this paper. (author). 43 refs., 25 tabs., 6 figs.

16621 (CONF-9304128–, pp. C.5) **Radiological worker II training implementing practical exercise training.** Seilhymer, P. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company (WHC) developed and implemented Practical Exercise Training as part of the Radiological Worker II Training Program. This program meets the requirements of the DOE Radiological Control Manual (DOE N5480.6) as stated in chapter 6. WHC developed the practical exercise based on input from several sources, including both DOE sites and public utilities as directed form INPO. Each student receives one-on-one evaluation by a qualified instructor/evaluator. An objective point-based

grading system requires that each student successfully complete the practical exercise with an 80% passing score. Emphasis during the exercise focuses on control of radiation exposure and contamination spread. The implementation of this practical exercise program does not require expending large amounts of money.

16622 (CONF-9304128–, pp. C.6) **Radiological control technician implementing continuing training.** Killand, B. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Hanford Company (WHC) has developed and is implementing a continuing training program for RCTs. This program was designed to meet the requirements of the DOE and Hanford Site Radiological Control Manual. The program is scheduled on a biennial (two year), six cycle format, where each cycle is seventeen weeks in length. This enables the technician to be in the classroom three times per year, for an average of four days each cycle. Content emphasis is placed on: academics review; lessons learned; new equipment and procedures; practical skills training; and oral board preparation. Academic reviews provide refresher training on core and site academics in both lecture and overview formats. During the first five cycles, an average of six lessons are presented. A preparatory exam is administered along with a quiz covering previous cycles. The sixth cycle is dedicated to an academic review of all previous lesson content, the final comprehensive exam, and the oral examination boards. In conjunction with continuing training, technicians receive additional company required training, providing a substantial cost savings to WHC. WHC employs approximately 300 RCTs.

16623 (CONF-9304128–, pp. C.19) **Post-training evaluation program for radiological worker training.** Sanders, M.D. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Savannah River Company (WSRC) has developed an innovative method to implement a post-training evaluation program for Radiological Worker Training. The DOE Radiological Control Manual requires that a method be established to verify the effectiveness of Radiological Control Training, which makes this innovative method more crucial. Savannah River Site's method utilizes videotaped scenarios which illustrates a variety of topics and situations covered in RWT. The use of realistic scenarios on videotapes places the usual mundane topics into a more interesting perspective for the radiological workers (4% of the population which is about 400 workers at SRS) and then administers a multiple-choice questionnaire, consisting of 20 objective-based questions. The results are used to determine which areas of the current RWT program need reinforcement. This is a continuous evaluation program and therefore, is repeated about every six months with new video material and questionnaires developed as needed. SRS is currently in the third cycle of the Post-Training Evaluation Program. The first Post-Training Evaluation was implemented from October 1991 - March 1992.

16624 (CONF-9304128–, pp. D.2) **Development of an external dosimetry technical basis manual.** Dyer, S.G. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Savannah River Company (WSRC) identified the need to develop a Technical Basis Manual for the site's external dosimetry program. This manual consolidates in a stand-alone document the various programmatic methods and supporting technical data on which the external dosimetry program is based. Recently published, the External Dosimetry Technical Basis Manual has become a ready reference for responding to inquiries about the program and will be used during DOELAP onsite assessments. The manual has also provided an excellent reference document for field health physicists as well as a mechanism for documenting new and innovative dosimetry techniques implemented at the Savannah River Site.

16625 (CONF-9304128–, pp. D.10) **A method, using ICRP 26 weighting factors, to determine effective dose equivalent due to nonuniform external exposures.** Dyer, S.G. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Savannah River Company (WSRC) has recently implemented a methodology and supporting procedures to calculate effective dose equivalent for external exposures. The calculations are based on ICRP 26 methodology and are used to evaluate exposures when multibadging is used. The methodology is based upon the concept of "whole body" compartmentalization (i.e., the whole body is separated into seven specific regions of radiological concern and weighted accordingly). The highest dose measured in each compartment is used to determine the weighted dose to that compartment. Benefits of determining effective dose equivalent are compliance with DOE Orders, more accurate dose assessments, and the opportunity for improved worker protection through new ALARA opportunities.

16626 (CONF-9304128–, pp. D.11) **Article 511 or a section 8 - which makes more sense?.** Murphy, G. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy Radiological Control Manual (RCM) addresses the requirements for issuing personnel dosimetry in Part 1, External Dosimetry, Section 511, Requirements. As in other areas of the RCM, there is an attempt to establish specific requirements for issuance of personnel dosimetry, but there is also considerable leeway based on some select phrases. Martin Marietta Energy Systems convened a working group of external dosimetry professionals to review several scenarios for issuance criteria and then adopted a final criteria after each scenario was evaluated against a standardized set of risk elements. Finally, recommended changes to Article 511 will be presented.

16627 (CONF-9304128–, pp. E.10) **The DOE in-vivo phantom library program.** Olsen, P.C. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The use of improved in vivo bioassay calibration phantoms in recent years has led to significant advances in the detection capabilities of in vivo counting laboratories, and increased ability to cross-calibrate various systems and laboratories for standardization purposes in DOE programs. The cost of these phantoms are significant, though, and this inhibits successful intercomparisons for improving calibrations. A recent CIRRPC Workshop on Internal Dosimetry in April 1992 recommended establishing intercomparison programs for in vivo measurements and improved phantom designs. Improved phantoms, developed at PNL with NIST-traceable source reference material loadings, proven solid tissue substitutes,

and extensive documentation on construction, activity, and physical and chemical composition are available through a newly operational library. These phantoms use original LLNL molds and existing BOMAB phantom shells, but with improved tissue substitutes. All phantom materials have been extensively tested for their chemical, physical, and radiation transmission properties, and are tailored for identical transmission characteristics at the photon energies of concern. PNL has been pursuing approval from NIST for "certification" of these phantoms. The DOE Phantom Library loans organ, whole-body, and through cooperation with USTR, an Am-241 skeletal phantom to DOE contractor laboratories without cost. Only the price of shipping the phantom is requested. This paper will discuss the operation of the library, the current and planned holdings, the quality of phantom construction, and planning for NIST cooperation in certifying these phantoms.

16628 (CONF-9304128–, pp. E.27) **A DOE/NRC dosimetry intercomparison study.** Loesch, R.M. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

A project to evaluate the consistency of internal dosimetry assessments has been jointly undertaken by the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) through the Pacific Northwest Laboratory. The focus of this pilot study is to identify problem areas that need to be resolved before establishing an accreditation program in internal dosimetry. A total of eleven laboratories, including DOE sites and NRC licensees, participated in this intercomparison study. A questionnaire consisting of five actual exposure scenarios, previously used in a European Study, was sent to participants for evaluation. The participating dosimetrists assessed the data of the test scenarios and provided results in terms of estimated radionuclide intake and the resulting internal doses. Except for one test case, results show that the standard deviation of the calculated doses for each scenario is within 30% to 50% of the mean value, giving a consistency comparable to that of the European study. The discrepancies can be attributed to variations in (1) the interpretation and statistical treatment of the bioassay data, (2) the biokinetic models used, and (3) the computational tools used. The results of this intercomparison study will provide information for improvements in future test protocols, which may eventually lead to an accreditation program.

16629 (CONF-9304128–, pp. H.2) **Formation of an environmental restoration user group for radiological controls.** Morris, R.L. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

An Environmental Restoration User Group for Radiological Controls will be proposed. Article 116 of the Radiological Control Manual encourages contractors to establish informal working associations that promote dialogue among similar facilities. Chem-Nuclear Geotech, Inc., is willing to initially organize and lead a users group to work on common problems, define standard methods, publish a Radiological Work Practices Handbook, and recommend regulatory changes to make environmental restoration programs more cost effective without compromising radiological control. A charter for the users group will be proposed. A questionnaire will be distributed to interested persons to assist in development of focus groups and agenda items for the first meeting. The first meeting is planned for May 25-26, 1993, in Grand Junction Colorado. All interested persons are welcome to attend.

16630 (CONF-9304128–, pp. K.2) **Current and future health physics research at Lawrence Livermore National Laboratory.** Hickman, D.P. (Lawrence Livermore National Lab., CA (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Livermore National Laboratory has developed several radiation protection instruments and continues to pursue new approaches in this area. Some of the instruments developed include innovative air-monitoring systems; neutron detection and dosimetry systems; specialized calibration materials and structures, such as the LLNL Realistic Torso Phantom; a fast-response detector system to detect stray beams from x-ray fluorescence devices that can be manufactured for less than $600; and a reliable, light weight personnel air-monitoring system that can be incorporated into a security badge/dosimeter package. A multi-disciplinary team of experts at LLNL is developing and testing cleanable/reusable high-efficiency particulate air-filtration systems and highly sensitive instrumentation for differentiating transuranic waste from non-transuranic waste; developing an advanced detector and circuit design for a hand-held neutron spectrometer; developing techniques for detecting neutron sources using CR-39 and for calibrating in-vivo measurement equipment using Magnetic Resonance Imaging and Monte Carlo simulation; and developing a seamless bottle mannequin adsorption (BOMAB) phantom with recessed fill caps, which have no potential for leakage of liquid sources used for calibrating whole-body counters.

16631 (CONF-9304128–, pp. A.2-A.55) **DOE radiological control manual implementation strategy at the Savannah River Site.** Cabbil, C. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Savannah River Site (SRS) is to "Serve the national security interest of the United States by safely producing nuclear materials while protecting the employee and public health, as well as the environment." There are 35 facilities at SRS associated with nuclear materials processing and support activities. Facility missions include Plutonium processing and storage, Tritium processing, and handling and storage of high level radioactive waste. The pursuit of excellence in the area of Radiation Protection has been a major area of emphasis for the site for the past 3 years, beginning with the aggressive effort to fully implement DOE Order 5480.11. With the issuance of DOE N 5480.6 in June 1992, effective date 12/1/92, a new phase for radiation protection program improvement was initiated. Based on the experience and lessons learned by the site during implementation of DOE Order 5480.11, the site developed a detailed implementation strategy to accomplish the guidelines set forth in the DOE Radiological Controls Manual.

16632 (CONF-9304128–, pp. A.56-A.57) **Implementation of the new DOE Radiological Control Manual.** Bush, T.S. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

In 1985, WINCO implemented their original Radiological Control Manual (RCM). In 1990 this manual was used as a basis for company wide RCM. Then in 1992 the Westinghouse RCM was utilized by DOE in the development of the DOE RCM. In December 1992 an individual was assigned as the Implementation coordinator. The implementation was divided into articles, and sometimes paragraphs and sentences. The implementation coordinator sent letters to each responsible individual to instruct them on the actions necessary to implement the article and the completion due date. The coordinator then made contact monthly to ensure the actions were being carried out. Because the assignment of responsible individuals came from their department managers, they were anxious to do whatever was necessary to close out the articles.

16633 (CONF-9304128–, pp. A.58-A.63) **Hanford Site Radiological Control Manual.** Munson, L.H. (Pacific Northwest Lab., Richland, WA (United States)); Vargo, G.J.; Selby, J.M.; Clark, D.L. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

In June 1992, the U.S. Department of Energy (DOE) issued DOE N5480.6, Radiological Control, which set forth DOE's Radiological Control Program and established the framework for its implementation at sites nationwide. Accompanying the Order was the DOE Radiological Control Manual (DOE RCM), which provided the detailed requirements for the program. The Order also mandated Field Office issuance of site-specific radiological control manuals by December 1, 1992. This paper presents the approach taken to develop, review, approve, implement, and subsequently maintain the site-specific manual for the DOE Richland Field Office (RL) at Hanford Site.

16634 (CONF-9304128–, pp. A.64-A.81) **Radiological control implementation guide.** Hamley, S.A. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

A manual is being developed to explain to line managers how radiological controls are designed and implemented. The manual also fills a gap in the Health Physics literature between textbooks and on-the-floor procedures. It may be helpful to new Health Physicists with little practical experience and to those wishing to improve self-assessment, audit, and appraisal processes. Many audits, appraisals, and evaluations have indicated a need for cultural change, increased vigor and example, and more effective oversight by line management. Inadequate work controls are a frequent and recurring problem identified in occurrence reports and accident investigations. Closer study frequently indicates that many line managers are willing to change and want to achieve excellence, but no effective guidance exists that will enable them to understand and implement a modern radiological control program.

16635 (CONF-9304128–, pp. A.82-A.84) **Radiological evaluation program by the Office of Nuclear Safety.** Blackwood, E.; Adamovitz, S. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Radiological Evaluation Program, managed and coordinated by the Office of Nuclear Safety, began in 1992. On January 16, 1992, the Secretary of Energy issued a memorandum which assigned responsibility Department-wide for radiological oversight to the Office of Nuclear Safety. On March 13, 1992, the Secretary issued a memorandum which required that radiological evaluations be initiated by the end of calendar year 1992, and the Radiological Oversight Division was formed within the Office of Nuclear Safety in April 1992.

16636 (CONF-9304128–, pp. B.11-B.13) **The Martin Marietta Energy Systems Associated Laboratories for Excellence in Radiation Technology (ALERT).** Bogard, J.S. (Oak Ridge National Lab., TN (United States)); Casson, W.H. Sr.; Bauer, M.L.; Gregory, D.C. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The excellence and uniqueness of radiation technology expertise at Oak Ridge National Laboratory (ORNL) was recognized during a review by the DOE Oak Ridge Field Office prior to a 1990 Tiger Team review, and the Laboratory was encouraged at that time to explore ways of sharing this expertise with other DOE facilities. The subsequent evolution of DOE Laboratory Accreditation Programs, with their challenging performance requirements, and of program guidance such as that contained in the DOE Radiation Control Manual, which requires improved radiological instrument services and encourages standardization, reemphasizes the importance of sharing ORNL's extensive capabilities for supporting improved radiological safety and health programs.

16637 (CONF-9304128–, pp. B.14-B.18) **Beta/gamma test problems for ITS.** Mei, G.T. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The Integrated Tiger Series of Coupled Electron/Photon Monte Carlo Transport Codes (ITS 3.0, PC Version) was used at Oak Ridge National Laboratory (ORNL) to compare with and extend the experimental findings of the beta/gamma response of selected health physics instruments. In order to assure that ITS gives correct results, several beta/gamma problems have been tested. ITS was used to simulate these problems numerically, and results for each were compared to the problem's experimental or analytical results. ITS successfully predicted the experimental or analytical results of all tested problems within the statistical uncertainty inherent in the Monte Carlo method.

16638 (CONF-9304128–, pp. B.19-B.25) **Trust versus confidence: Microprocessors and personnel monitoring.** Chiaro, P.J. Jr. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC05-84OR21400. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Due to recent technological advances, substantial improvements have been made in personnel contamination monitoring. In all likelihood, these advances will close out the days of manually frisking personnel for radioactive contamination. Unfortunately, as microprocessor-based monitors become more widely used, not only at commercial power reactors but also at government facilities, questions concerning their trustworthiness arise. Algorithms make decisions that were previously made by technicians. Trust is placed not in technicians but in machines. In doing this it is assumed that the machine never misses. Inevitably, this trust drops, due largely to "false alarms." This is especially true when monitoring for alpha contamination. What is a "false alarm?" Do these machines and their algorithms that we put our trust in make mistakes? An analysis was performed on half-body and hand-and-foot monitors at Oak Ridge National Laboratory (ORNL) in order to justify the suggested confidence level used for alarm point determination. Sources used in this analysis had activities approximating ORNL's contamination limits.

16639 (CONF-9304128–, pp. B.2-B.10) **New approaches to instrumentation and calibration.** Bishop, R.V. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

DOE facilities are required to offer for sale to the public items of salvageable value when they are no longer required by the facilities. These items have to be surveyed to ensure radioactive

contamination levels do not exceed the values listed in DOE Order 5400.5. Most facilities use portable contamination monitoring equipment with probe areas between 20 and 100 cm^2 to check for fixed contamination. This procedure is very labor intensive and results in survey costs that often exceed the costs recovered from selling the items. A solution would be to use large are (> 100 cm^2) detectors to find and quantify contamination. Large area scintillation detectors that can be used for beta and alpha detection simultaneously are becoming available commercially. Combining these with a rate meter than can differentiate between alpha and beta events can result in a survey that takes considerably less time to do and will save a proportional amount of money in doing so. The use and limitations of this combination of detectors and rate meters will be discussed.

16640 (CONF-9304128–, pp. B.35-B.43) **ISO standards on the evaluation of contamination.** Swinth, K.L. (Pacific Northwest Lab., Richland, WA (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The International Organization for Standardization (ISO) develops radiation calibration standards through Subcommittee 2 (titled "Radiation Protection") of Technical Committee 85 (ISO/TC85/SC2). The subcommittee has also developed standards providing guidance on the performance of measurements. ISO/TC85/SC2 consists of international technical experts who represent their countries through the international consensus process in providing guidance in several radiation protection areas. The purpose of this paper is to summarize ISO's guidance provided in the area of contamination measurements.

16641 (CONF-9304128–, pp. C.10-C.18) **DOE Radiological Control Manual Core Training Program.** Scott, H.L.; Maisler, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past year, the Department of Energy (DOE) Office of Health (EH-40) has taken a leading role in the development of new standardized radiological control training programs for use throughout the DOE complex. The Department promulgated its Radiological Control (RadCon) Manual in June 1992. To ensure consistent application of the criteria presented in the RadCon Manual, standardized radiological control core training courses and training materials have been developed for implementation at all DOE facilities. In producing local training programs, standardized core courses are to be supplemented with site-specific lesson plans, viewgraphs, student handbooks, qualification standards, question banks, and wallet-sized training certificates. Training programs for General Employee Radiological Training, Radiological Worker I and II Training, and Radiological Control Technician Training have been disseminated. Also, training committees under the direction of the Office of Health (EH-40) have been established for the development of additional core training courses, development of examination banks, and the update of the existing core training courses. This paper discusses the current activities and future direction of the DOE radiological control core training program.

16642 (CONF-9304128–, pp. C.2-C.4) **Development and implementation of a radiological worker training program for an architect/engineer contractor.** Niemuth, W. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Prior to the implementation of the DOE Rad Con Manual, Kaiser Engineers Hanford offered a four hour radiation worker class, which met all DOE 5480.11 requirements. This class included a dress/undress exercise. The content of the class was focused on the construction worker who is our typical radiation worker. We did not go into depth on the theory material, having a general feeling that this would not be essential information to the typical construction worker. We tried to gear the class to the level of understanding of the average craft worker. We provide training to 500 employees in the average year.

16643 (CONF-9304128–, pp. C.7-C.9) **A defense programs training initiative in the area of radiological control.** Larsen, D. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

In a memorandum of January 16, 1992, former Secretary of Energy Watkins directed that line management take immediate action to ensure that personnel assigned to monitor the onsite performance of the contractor radiation protection activities receive proper training. Consequently, the Office of Defense Programs has developed two courses: a two-week conduct of radiological operations course to provide an introductory course of basic health physics theory and recommend applied health physics practices for evaluation of radiological operations at DOE sites; and, a two-day conduct of radiological operations course to give an overview of the Radiological Control Manual and of applied health physics at the various types of DOE facilities.

16644 (CONF-9304128–, pp. D.3-D.9) **Personnel dose assignment practices.** Fix, J.J. (Pacific Northwest Lab., Richland, WA (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Implementation of DOE N 5480.6 Radiological Control Manual Article 511(3) requirements, to minimize the assignment of personnel dosimeters, should be done only under a broader context ensuring that capabilities are in place to monitor and record personnel exposure both for compliance and for potential litigation. As noted in NCRP Report No. 114, personnel dosimetry programs are conducted to meet four major objectives: radiation safety program control and evaluation; regulatory compliance; epidemiological research; and litigation. A change to Article 511(3) is proposed that would require that minimizing the assignment of personnel dosimeters take place only following full evaluation of overall capabilities (e.g., access control, area dosimetry, etc.) to meet the NCRP objectives.

16645 (CONF-9304128–, pp. E.11-E.14) **Evaluation of an intake of plutonium 238: A case history.** La Bone, T.R.; Kim, E.M. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

In July 1991 a plutonium worker at the Savannah River Site (SRS) was exposed to airborne plutonium-238 from a contaminated shipping container. She was chelated with Zn-DTPA shortly after the incident and placed on a special bioassay program. Based on early urinary and fecal excretion, an initial dose estimate of 1525 mrem committed effective dose equivalent (CEDE) was reported 20 days later. As additional bioassay data were collected the dose was revised to 1840 mrem CEDE on day 88 and to 3660 mrem CEDE on day 245. This last estimate was officially reported to the Department of Energy (DOE). The urinary excretion data and expectation curve for the model are shown. Only the data to

the left of the first vertical line (3/92 Evaluation) were available at the time of the initial dose estimate.

16646 (CONF-9304128–, pp. E.15-E.26) **Plutonium bioassay by inductively coupled plasma mass spectrometry (ICP/MS).** Wyse, E.J. (Pacific Northwest Lab., Richland, WA (United States)); Fisher, D.R. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The determination of plutonium in urine poses several analytical challenges, e.g., detectability, matrix, etc. We have investigated the feasibility of analyzing plutonium in processed urine by inductively coupled plasma mass spectrometry (ICP/MS). The urine samples are first spiked with ^{244}Pu as a tracer and internal standard, then processed by co-precipitation and column chromatography using TRU-Spec™, an extraction resin. By enhancing ICP/MS detection capabilities via improved sample introduction via improved sample introduction and data acquisition efficiencies, an instrumental detection limit of 5 to 50 fg (0.3 to 3 fCi for ^{239}Pu) is typically obtained, depending on the desired degree of quantitation. A brief summary of the analytical method as well as the basis for measuring radionuclides by ICP/MS are submitted; the separation procedure, methods of sample introduction, and data acquisition techniques are then highlighted.

16647 (CONF-9304128–, pp. E.2-E.7) **Internal dosimetry and lifetime dose control-impacts of the U.S. Department of Energy Radiological Control Manual.** Baumann, B.L.; Aldridge, T.L. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

This paper outlines Westinghouse Hanford Company (WHC) implementation of lifetime worker dose controls, required in the US Department of Energy (DOE) Radiological Control Manual (RCM) (DOE 1992). In addition, this paper discusses the impacts of tracking doses from intakes of long-term bone seeking radionuclides. Prior to the RCM, an internal WHC policy implemented lifetime dose controls based on total internal and external dose. This lifetime dose control level has affected the careers of approximately 17 workers at the Hanford Site. Additional impacts are anticipated because changes in tracking internal doses increase the significance of tracking plutonium intakes.

16648 (CONF-9304128–, pp. E.8-E.9) **Categorization of worker bioassay programs based on intake potential.** Thomas, S.A.; McFee, M.C.; La Bone, T.R. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The routine bioassay program at the Savannah River Site (SRS) has undergone considerable change in the last ten years. The causes of this change may be traced to changes in personnel and regulations during this time. Prior to the 1980's, the workforce was relatively small, stable, and experienced. Bioassay programs were administered in the field by Health Protection personnel who were very familiar with all the personnel in their facility and the potential problems that could occur in those facilities. The radiation protection regulations had not changed drastically in 20 years, and they were based on readily understood quantities such as the quantity of radioactive material in the body.

16649 (CONF-9304128–, pp. F.11-F.13) **PC edit package for testing of annual radiation dose summary data.** Millet, W.H. (Idaho National Engineering Lab., Idaho Falls, ID (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC07-76ID01570. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this presentation is to introduce a software package for the testing of annual radiation dose summary data by the DOE contractor site prior to submitting the report to DOE's Radiation Records Repository. This software will identify most errors existing in the annual radiation dose summary data before the data leaves the originating site. This process will greatly reduce the reviewing and editing tasks of staff members at the repository.

16650 (CONF-9304128–, pp. F.14-F.24) **Dose variables to serve radiation protection and epidemiologic needs.** Fix, J.J. (Pacific Northwest Lab., Richland, WA (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) implemented the Comprehensive Epidemiologic Data Resource (CEDR) to facilitate independent research to validate and supplement DOE research on human health effects. A dosimetry working group was formed during 1991 to evaluate radiation dose variables and associated documentation that would be most useful to researchers for retrospective and prospective studies. The working group included dosimetrists and epidemiologists from several DOE laboratories. An overview of the recommendations included in the final report from the working group is presented. Basically, relatively minor additions to routine dose assessment and record keeping practices are needed to provide important parameters necessary for prospective epidemiologic evaluations. Without these additions, serious inconsistencies between past and current recorded dose will occur, and the data will be more limited for epidemiologic purposes.

16651 (CONF-9304128–, pp. F.2-F.10) **Development and implementation of a new radiation exposure record system.** Lyon, M. (Pacific Northwest Lab., Richland, WA (United States)); Berndt, V.L.; Trevino, G.W.; Oakley, B.M. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Radiological Records Program (HRRP) maintains all available radiation exposure records created since the 1940s for employees of and visitors to the Hanford Site. The program provides exposure status reports to the US Department of Energy Richland Operations Office (DOE-RL) and the Hanford contractors, annual exposure reports to individual employees and visitors, and exposure reports to terminated employees. Program staff respond to offsite requests for exposure data on former employees and supply data and reports for epidemiological and research projects as well as for annual reports required by DOE Orders. Historical files, documenting radiation protection and dosimetry policies, procedures, and practices, and radiological incidents, are also maintained under this program. The program is operated by Pacific Northwest Laboratory for DOE-RL. This paper describes how the record-keeping requirements supported by the HRRP's computerized radiation exposure database were analyzed so that the system could be redeveloped and implemented to (1) accommodate a change in mainframe computer units, and (2) to enhance its automated record-keeping, retrieval, and reporting capabilities in support of the HRRP.

16652 (CONF-9304128–, pp. G.14-G.26) **A case study on determining air monitoring requirements in a radioactive materials handling area.** Newton, G.J. USDOE Assistant Secretary for

Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

A technical, defensible basis for the number and placement of air sampling instruments in a radioactive materials handling facility was developed. Historical air sampling data, process and physicochemical knowledge, qualitative smoke dispersion studies with video documentation, and quantitative trace gas dispersion studies were used to develop a strategy for number and placement of air samplers. These approaches can be used in other facilities to provide a basis for operational decisions. The requirements for retrospective sampling, personal sampling, and real-time monitoring are included. Other relevant operational decisions include selecting the numbers, placement, and appropriate sampling rates for instruments, identifying areas of stagnation or recirculation, and determining the adequacy and efficiency of any sampling transport lines. Justification is presented for using a graded approach to characterizing the workplace and determining air sampling and monitoring needs.

16653 (CONF-9304128–, pp. G.2-G.7) **Technical basis and evaluation criteria for an air sampling/monitoring program.** Gregory, D.C. (Oak Ridge National Lab., TN (United States)); Bryan, W.L.; Falter, K.G. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC05-84OR21400. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Air sampling and monitoring programs at DOE facilities need to be reviewed in light of revised requirements and guidance found in, for example, DOE Notice 5480.6 (RadCon Manual). Accordingly, the Oak Ridge National Laboratory (ORNL) air monitoring program is being revised and placed on a sound technical basis. A draft technical basis document has been written to establish placement criteria for instruments and to guide the "retrospective sampling or real-time monitoring" decision. Facility evaluations are being used to document air sampling/monitoring needs, and instruments are being evaluated in light of these needs. The steps used to develop this program and the technical basis for instrument placement are described.

16654 (CONF-9304128–, pp. G.27-G.45) **Calibration and operation of continuous air monitors for alpha-emitting radionuclides.** Hoover, M.D.; Newton, G.J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Spectrometer-based continuous air monitors have improved our capabilities for detecting aerosols of alpha-emitting radionuclides. This paper describes basic requirements and statistical limitations in the sensitivity of alpha continuous air monitors, and presents a technical basis for selecting the energy window for detection of uranium and plutonium aerosols, correcting for interference from airborne dust, selecting filters with low pressure drop and good front surface collection characteristics, and properly using electroplated calibration sources. Sensitivity limits are described for detecting uranium or plutonium aerosols in the presence of increased concentrations of naturally occurring, alpha-emitting radon progeny radionuclides. Decreasing the lower energy boundary of the detection window from 4.3 MeV to 2.7 MeV improves by a factor of three the detection of plutonium in the presence of dust, while causing minimal additional interference from ambient radon progeny. Selection of the Millipore Fluoropore teflon membrane filter reduces both pressure drop and interference from ambient radon progeny by up to a factor of two. Field collection of ambient radon progeny can be used to verify the proper energy of alpha emissions from electroplated calibration sources. In the absence of energy verification, errors in instrument calibration may result from solid state diffusion of the electroplated calibration radionuclide into the substrate plate.

16655 (CONF-9304128–, pp. G.46-G.54) **Evaluation results of various commercial air monitors for use at the Oak Ridge National Laboratory.** Falter, K.G. (Oak Ridge National Lab., TN (United States)); Bryan, W.L.; Chiaro, P.J. Jr. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC05-84OR21400. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Air monitoring requirements have changed considerably, due to the new requirements found in the Radiological Control (RADCON) Manual, and in the Occupational Radiation Protection Rulemaking (Title 10, Code of Federal Regulations, Part 385). Many new instrument and facility evaluations have begun due to these new guidance documents. In particular, the requirements for air monitoring have been changed dramatically. An evaluation of commercially available air monitors was initiated to identify the proper system which would meet the requirements of facilities located at the Oak Ridge National Laboratory (ORNL). Various systems were evaluated, including alpha, beta, and alpha/beta air monitors. The manufacturers of these air monitors include Berthold, Canberra, Eberline, and Ludlum. Technical evaluations of these instruments were required due to the wide range of isotopes used in the current and historical operations at ORNL. The evaluations completed at ORNL were compiled from the ANSI N42.17B-1989 entitled, "Performance Specifications for Health Physics Instrumentation - Occupational Airborne Radioactivity Monitoring Instrumentation," the requirements of the previously mentioned DOE documents, and the pertinent requirements pertaining to air monitoring at ORNL facilities. The results of these evaluations and our conclusions clearly point out that the optimum air monitor for all activities at ORNL cannot be found.

16656 (CONF-9304128–, pp. G.55-G.59) **Alternative concepts for design of air monitoring instruments: In-line and open face reference samplers and a new method of demonstrating alpha CAM performance.** Rodgers, J.C. (Los Alamos National Lab., NM (United States)); McFarland, A.R. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past several years Los Alamos, Texas A&M University and Canberra Instruments have been collaborating on the development of advanced continuous air monitoring and air sampling concepts and technology. We have successfully completed the design of an alpha CAM which embodies a number of innovations in the way radon progeny background interference is controlled and compensated, and in the way data processing, alarm generation, and data communication are handled.

16657 (CONF-9304128–, pp. G.8-G.13) **CAM correlation to fixed air sample data at Los Alamos National Laboratory.** Whicker, J. (Los Alamos National Lab., NM (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Continuous air monitoring instruments (CAMs) deployed in laboratories in the TA-55 plutonium facility at Los Alamos National Laboratory (LANL) alarmed less than 33 percent of the time when

fixed air sample measurements in the same laboratory showed integrated concentrations exceeding 500 DAC-hrs. The purpose of this study was to explore effects of non-instrument variables on alarm sensitivities for properly working CAMs. Non-instrument variables include air flow patterns, particle size of released material, and the energy of the release. Dilution Factors (DFs) for 21 airborne releases in various rooms and of different magnitudes were calculated and compared. The median DF for releases where the CAM alarmed was 13.1 while the median DF for releases where the CAM did not alarm was 179. Particle sizes ranged considerably with many particles larger than 10 μm. The cause of the release was found to be important in predicting if a CAM would alarm with releases from bagouts resulting in the greatest percentage of CAM alarms. The results of this study suggest that a two-component strategy for CAM placement at LANL be utilized. The first component would require CAMs at exhaust points in the rooms to provide for reliable detection for random release locations. The second component would require placing CAMs at locations where releases have historically been seen. Finally, improvements in CAM instrumentation is needed.

16658 (CONF-9304128–, pp. I.3-I.6) **Off-site contamination at Oak Ridge National Laboratory.** Setaro, J.A. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

An upgrade of the radioactive liquid waste system at Oak Ridge National Laboratory (ORNL) had been underway for the past several years. One of the upgrades involves the construction of a Monitoring and Control Station (MCS) which will receive waste from an analytical chemistry building prior to the waste being discharged to the main waste processing area. The MCS was located in a radiologically clean area adjacent to the analytical chemistry facility and no monitoring of personnel was necessary. On December 29, 1992, workers became contaminated and left the site prior to the discovery of the contamination. This paper outlines the actions surrounding this event including: the discovery of contamination; actions taken to minimize the spread of contamination; fears of employees; public relations; and lessons learned.

16659 (CONF-9304128–, pp. I.7-I.12) **Program enhancements resulting from the off-site contamination event.** Jarvis, J.S.; Meiners, S.E. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides information relating to an offsite contamination event at the Paducah Gaseous Diffusion Plant and describes some of the general program enhancements resulting both directly and indirectly from that incident. Workers not routinely assigned to the facility, but certified to operate the facility, received contamination on their skin, and on company issued clothing. The contamination was carried to other areas of the building into non-radiological areas and eventually contaminated a few items of personal clothing, although the levels were below allowable release limits. Underlying causes of the contamination included personnel who performed the required frisking upon exit from the radiological area, but did not recognize or acknowledge the alarm monitor while frisking. In general, the workers had a poor understanding of radiological controls and their application. Worker attitude was no appropriate and inadequate training was also a contributing factor, related to worker attitudes. Immediately following the incident numerous compensatory measures took place.

16660 (CONF-9304128–, pp. J.2-J.13) **BNL ALARA center's development of a computerized Radiological Assessment and Design System (RADS).** Dionne, B.J. (Brookhaven National Lab., Upton, NY (United States)); Connelly, J.M. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE) Office of Health Physics and Industrial Hygiene sponsored a study of Radiological Engineering Programs at selected DOE contractor facilities. This study was conducted to review, evaluate, and summarize techniques and practices that should be considered in the design phase that reduce dose and the spread of radioactive materials during subsequent construction and operation at DOE radiological facilities. As in a previous study on operational ALARA programs, a variety of "good-practice documents" will be generated. It is envisioned that these documents will serve as a resource to assist radiological engineers in the process of designing radiological facilities, and in performing radiological safety/ALARA design reviews. This paper presents the features for three good-practice documents and related software applications that are being developed based on the findings of this study. The proposed software called "Radiological Assessment and Design System" (RADS) will be a menu-driven database and spreadsheet program. It will be designed to provide easy, consistent, and effective implementation of the methodologies described in the three good-practice documents. These documents and the associated RADS software will provide the user with the following three functions: (1) enter dose assessment information and data into computer worksheets and provide printed tables of the results which can then be inserted into safety analysis reports or cost-benefit analysis, (2) perform a wide variety of sorts of radiological design criteria from DOE Orders and produce a checklist of the desired design criteria, and (3) enter cost/benefit data and qualitative ratings of attributes for various design alternatives which reduce dose into computer worksheets and provide printed reports of cost-effectiveness results.

16661 (CONF-9304128–, pp. K.15-K.28) **Dissolution rate and radiation dosimetry of metal tritides.** Cheng, Y. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC04-76EV01013. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Metal tritides including titanium tritide (Ti ^3H_x) and erbium tritide (Er ^3H_x) have been used as components of neutron generators. These compounds can be released to the air as aerosols during fabrication, assembling, and testing of components or in accidental or fugitive releases; as a result, workers may be exposed to these compounds by inhalation. A joint research project between Sandia National Laboratories and the Inhalation Toxicology Research Institute was initiated last fall to investigate the solubility of metal tritide particles, to determine retention and translocation of inhaled particles in animals, and to develop an internal dosimetry model. The current understanding of metal tritides and their radiation dosimetry for dosimetry in metal tritide form. However, a few papers in the literature suggest that the solubility of metal tritide could be low. The current radiation protection guidelines for metal tritide particles are based on the assumption that the biological behavior is similar to tritiated water which could be easily absorbed into body fluid, and therefore, a relatively short biological half life (10 days). If the solubility is low, exposure to these particles could be quite different from tritiated water. This would have significant implications in the current health protection guidelines including annual limits of intakes and derived air concentrations. The preliminary results of our metal tritide dissolution study indicated that the solubility of titanium tritide is low.

16662 (CONF-9304128–, pp. K.3-K.14) **Research in extremity dosimetry and contamination measurements.** Durham, J.S. (Pacific Northwest Lab., Richland, WA (United States)); Smith, M.H. USDOE Assistant Secretary for Environment, Safety, and Health,

Washington, DC (United States). Office of Health; USDOE Nevada Field Office, Las Vegas, NV (United States). [1993]. DOE Contract AC06-76RL01830. From Department of Energy (DOE) radiation protection conference; Las Vegas, NV (United States); 13-15 Apr 1993. In *1993 Radiation Protection Workshop: Proceedings.* 431p. Order Number DE95004507. Source: OSTI; NTIS; INIS; GPO Dep.

Research in the fields of extremity dosimetry and contamination measurements is currently proceeding at Pacific Northwest Laboratory. The research began as a study of materials and dosimeters that could improve the detection capability and accuracy of beta dosimetry. The goal of the research is to develop improved methods of performing extremity dosimetry measurements and measurements of surface contamination. This paper describes the past accomplishments that led to the current research focus and discusses work that has been proposed for the near future. The technical basis for performing the research is also provided.

16663 (CONF-9404248–1) **Mice, myths, and men.** Fry, R.J.M. (Oak Ridge National Lab., TN (United States). Biology Div.). Oak Ridge National Lab., TN (United States). [1994]. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From National Council on Radiation Protection and Measurement (NCRP) conference; Bethesda, MD (United States); 6 Apr 1994. Order Number DE95008784. Source: OSTI; NTIS; INIS; GPO Dep.

The author discusses some examples of how different experimental animal systems have helped to answer questions about the effects of radiation, in particular, carcinogenesis, and to indicate how the new experimental model systems promise an even more exciting future. Entwined in these themes will be observations about susceptibility and extrapolation across species. The hope of developing acceptable methods of extrapolation of estimates of the risk of radiogenic cancer increases as molecular biology reveals the trail of remarkable similarities in the genetic control of many functions common to many species. A major concern about even attempting to extrapolate estimates of risks of radiation-induced cancer across species has been that the mechanisms of carcinogenesis were so different among different species that it would negate the validity of extrapolation. The more that has become known about the genes involved in cancer, especially those related to the initial events in carcinogenesis, the more have the reasons for considering methods of extrapolation across species increased.

16664 (DOE/ER–0645) **Summaries of fiscal year 1994 projects in medical applications and biophysical research.** US-DOE Office of Energy Research, Washington, DC (United States). Medical Applications and Biophysical Research Div. Apr 1995. 123p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010405. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides information on the research supported in Fiscal Year 1994 by the Medical Applications and Biophysical Research Division of the Office of Health and Environmental Research. A brief statement of the scope of the following areas is presented: dosimetry; measurement science; radiological and chemical physics; structural biology; human genome; and medical applications. Summaries of the research projects in these categories are presented.

16665 (DOE/ER/60960–T1) **Activities of the National Academy of Sciences in relation to the Radiation Effects Research Foundation. Progress report, June 1, 1993–September 30, 1994.** Edington, C.W. National Academy of Sciences - National Research Council, Washington, DC (United States). Nov 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-90ER60960. Order Number DE95010176. Source: OSTI; NTIS; INIS; GPO Dep.

In the past sixteen months, research in all areas at RERF has continued and important progress has been made in our understanding of the late somatic and genetic effects resulting from exposure of this human population to radiation from the atomic bombs. Evidence of this productivity is emphasized by the fact that 66 papers have been published in the scientific literature over the past one and one-half years. In addition, a number of others are in press. The continued follow-up of the various RERF study cohorts is of considerable importance because greater than 50 percent of the survivors in the Life Span Study (LSS) cohort are still alive, and over 80 percent of those alive were under the age of 30 at the time of the bomb. Since evidence obtained to date indicates that individuals exposed at a young age are more sensitive to radiation than those exposed at older ages, it is important that surveillance of the RERF population continue to ascertain the late health effects that will occur in the more sensitive segment of the exposed population which is just now reaching the cancer-prone age.

16666 (DOE/NV/11432–163) **The 1993 baseline biological studies and proposed monitoring plan for the Device Assembly Facility at the Nevada Test Site.** Woodward, B.D.; Hunter, R.B.; Greger, P.D.; Saethre, M.B. Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Feb 1995. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95007960. Source: OSTI; NTIS; GPO Dep.

This report contains baseline data and recommendations for future monitoring of plants and animals near the new Device Assembly Facility (DAF) on the Nevada Test Site (NTS). The facility is a large structure designed for safely assembling nuclear weapons. Baseline data was collected in 1993, prior to the scheduled beginning of DAF operations in early 1995. Studies were not performed prior to construction and part of the task of monitoring operational effects will be to distinguish those effects from the extensive disturbance effects resulting from construction. Baseline information on species abundances and distributions was collected on ephemeral and perennial plants, mammals, reptiles, and birds in the desert ecosystems within three kilometers (km) of the DAF. Particular attention was paid to effects of selected disturbances, such as the paved road, sewage pond, and the flood-control dike, associated with the facility. Radiological monitoring of areas surrounding the DAF is not included in this report.

16667 (IC–94/234, pp. 2) **Search for bioorganic compounds and organisms on Mars.** Ishikawa, Y. (Obayashi Corp., Tokyo (Japan). Space Project Dept.); Kaneko, T.; Kobayashi, K.; Kawasaki, Y.; Yanagawa, H.; Koike, J.; Oshima, T.; Saito, T.; Yamamoto, T. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

From the experiment with accelerator beams, simulating interactions of cosmic rays with atmosphere in primitive planets and satellites, we concluded that the bioorganic compounds like amino acids is easily formed in a simple gas mixture by bombarding charged particles, even if they are not a strongly deduced gas such as CH_4 and HN_3. Organic compounds might be formed in primitive Mars, because a substantial amount of water had existed in Mars 4 billion years ago. On the other hand, we found that cosmic rays is one of the most effective energy source for chemical evolution not only in the heliosphere as well as in interstellar space. Although neither organic compounds nor organisms were detected in Mars by Viking in 1970's, we cannot exclude their existences in Mars. Because, the soil samples, which were collected from the Mars surface, might be irradiated by ultraviolet sunlight and might be strongly oxidizing soils. We plan to send a new instrument to the places where the traces of water were found or near the poles of Mars. The proposed instrument consists of a quadrupole mass spectrometer to detect chemical compounds and a fluorescent microscope system to detect organisms (cells) and bioorganic compounds in bulk. We propose to carry out this program as an international cooperative work with scientists and technicians in the world, who are interested or already working in this field. (author). Abstract only.

16668 (IC–94/308) **Damages induced to the eye lens crystallins after treatment with beta radiations from Sr^{90}.** El-Refaei, F.M. (International Centre for Theoretical Physics, Trieste (Italy));

Gamal, M.M.; Fadel, M.A. International Centre for Theoretical Physics, Trieste (Italy). Dec 1994. 23p. Order Number DE95627782. Source: OSTI; NTIS (US Sales Only); INIS.

In this work, one of the two eyes of New Zealand rabbits from both sex were irradiated with β-particles from Sr^{90} source to 10, 20, 40 and 60 Gy. Also, the effect of β-particles on the lens after 3 months of exposure to 20 and 60 Gy was studied. The changes in the molecular structure of the crystallin lens for the treated and the untreated eyes were measured through the use of gel permeation chromatography. The electrophoretic mobility was also studied. The results indicated that both treated and untreated lenses were suffered pronounced injuries in protein structure. No recovery occurred after 3 months of exposure to 20 and 60 Gy. (author). 9 refs, 12 figs, 1 tab.

16669 (IC–94/309) **Changes induced to eye lens membrane characterization after treatments with beta radiation from Sr^{90}.** El-Refaei, F.M. (International Centre for Theoretical Physics, Trieste (Italy)); Morris, M.; Gamal, M.M.; Fadel, M.A. International Centre for Theoretical Physics, Trieste (Italy). Dec 1994. 26p. Order Number DE95627783. Source: OSTI; NTIS (US Sales Only); INIS.

The effect of β-particles on Na^+ and k^+ content, Na^+-k^+ ATPase and histopathological changes of cell membrane were studied in the present work. One of the two eyes of New Zealand rabbits from both sexes were irradiated with β-particles from Sr^{90} source to 10, 20, 40 and 60 Gy. The effect of β-particles on lens membrane after 3 months of exposure to 20 and 60 Gy was also studied. The results indicated that the treated and untreated eyes suffered pronounced injuries which deduced from the distribution of ATPase in comparison with the normal control which showed a decrease (reached 52%). As well as uncontrolled transport of the Na^+ and k^+ through the membrane and injuries appeared in the histopathological studies. (author). 12 refs, 15 figs, 4 tabs.

16670 (INIS-mf–14511) **Effects of low level ionizing radiation.** Habjouqa, Ammar (ed.). Ministry of Energy and Mineral Resources, Amman (Jordan). 1992. 24p. (In Arabic). Order Number DE95627790. Source: OSTI; NTIS (US Sales Only); INIS.

A discussion of the effects of low level radiation. The atomic structure of matter, types of ionizing radiation, radiation units, the biological effects of ionizing radiation, sources of ionizing radiation, the basic principles of radiation protection, and the equivalent dose limits are discussed. (author). 2 figs., 4 tabs.

16671 (INIS-mf–14521) **Dosimetry of persons in Switzerland occupationally exposed to radiation. 18. Report of the Federal Commission on Radiation Protection.** Bundesamt fuer Gesundheitswesen (BAG), Bern (Switzerland). 1993. 29p. (In German, French). Order Number DE95627829. Source: OSTI; NTIS; INIS.

The report is a summary of the data that was registered in Switzerland from 10 dosimetric stations for people. Given are whole and part body doses, doses as a result of incorporation as well as the accumulated total doses. 8 figs., 6 tabs.

16672 (INIS-mf–14526) **Monitoring of radioactive discharges from nuclear power plants.** Winkelmann, I.; Becker, D.E.; Ruehle, H. Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. 1994. 12p. (CONF-9410338–: Environmental Radioactivity: national seminar with international participation, Sofia (Bulgaria), 11-13 Oct 1994). Order Number DE95627830. Source: OSTI; NTIS (US Sales Only); INIS.

The system of measurement of gaseous and liquid releases from NPP's into the environment in Germany is described. The emissions are continuously monitored by the operators according to uniform regulations and reported to the authorities. The quality of the measurements is assured by officially commissioned experts in accordance with the federal rule. The operators' measurements are supplemented by remote monitoring system operated by the state authorities. The measured discharges are the basis for calculation of the radiation exposure of the public. 5 tabs., 10 refs. (orig.).

16673 (INIS-mf–14529, pp. 48) **Lyoluminescence of sugar for a possible application in accident dosimetry.** Smital, H.; Hille, P.; Leitner-Wild, E.; Nowotny, R. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSIMETRY/radiation accidents; LYOLUMINESCENCE/irradiation; LYOLUMINESCENCE/saccharose; COBALT 60; DOSE-RESPONSE RELATIONSHIPS; DOSIMETRY; GAMMA RADIATION; LYOLUMINESCENCE; IRRADIATION; SACCHAROSE; RADIATION DOSES

16674 (INIS-mf–14529, pp. 49) **A device for checking the automatic exposure control in mammography.** Nowotny, R. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Walter-Opletal, S. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MAMMARY GLANDS/biomedical radiography; RADIATION MONITORING/radiation doses; AMPLIFIERS; ELECTROMETERS; IONIZATION CHAMBERS; PULSE INTEGRATORS

16675 (INIS-mf–14530, pp. 36-37) **Lyoluminescence of sugar for a possible application in accident dosimetry.** Smital, H.R.; Leitner-Wild, E.; Nowotny, R.; Hille, P. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DOSIMETRY/radiation accidents; LYOLUMINESCENCE/irradiation; LYOLUMINESCENCE/saccharose; LYOLUMINESCENCE/salts; COBALT 60; DOSE-RESPONSE RELATIONSHIPS; DOSIMETRY; GAMMA RADIATION; LYOLUMINESCENCE; IRRADIATION; SACCHAROSE; SALTS; RADIATION DOSES; THERMOLUMINESCENCE

16676 (INIS-mf–14530, pp. 38) **The Austrian national radon project (OENRAP).** Friedmann, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RADON/austria; RADON/inhalation; LUNGS; NATURAL RADIOACTIVITY; NEOPLASMS; RADIATION DOSES; RADON; AUSTRIA; INHALATION

16677 (JAERI-Data/Code–94-016) **Development of evaluation method of collective dose of general public considering the daily life activity and time use.** Nagaoka, Toshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Saito, Kimiaki; Sakamoto, Ryuichi; Tsutsumi, Masahiro; Moriuchi, Shigeru. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 58p. (In Japanese). Order Number DE95768149. Source: OSTI; NTIS; INIS.

A code for evaluation of collective dose of general public to natural radiation has been developed, in which the variation of dose rate due to place of stay is taken into consideration. Only external exposure to natural radiation is subject to discussion in this report. Strict manner of dose evaluation requires the dose rate and the time period of stay for each place and for each person. It is possible to know (measure) them all, but not practicable. In this code, dose rate information was obtained from actually measured data by the authors and estimation based on the environmental conditions. Information on the time period of stay was obtained from a Survey Data on Time Use and Leisure Activities by Management and Coordination Agency, and from Statistical Yearbook of Tokyo with some realistic assumptions. By using them, collective dose was evaluated taking both the daily life style and dose rate varying place by place into consideration. In this report, the dose evaluation code and the results about doses for Tokyo citizens are mentioned. (author).

16678 (JAERI-Review–94-007) **Health physics in JAERI No.36. April 1, 1993 - March 31, 1994.** Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. 281p. (In Japanese). Order Number DE95768158. Source: OSTI; NTIS; INIS.

In the annual report No.36(fiscal 1993) are described the activities of health physics in Tokai Research Establishment, Naka Fusion Research Establishment, Takasaki Radiation Chemistry Research Establishment, Oarai Research Establishment, Mutsu

Establishment and Nuclear Ship Mutsu. In all the establishments, radiation monitoring in nuclear facilities, individual monitoring, environmental monitoring and maintenance of monitoring instruments were carried out as in the previous years. There were no occupational exposure exceeding the effective dose equivalent limit and no release of radioactive gaseous and liquid wastes beyond the release limits specified in the regulations. In the environment, no abnormal radioactivity was detected attributable to the facilities. Technology developments were made as in the previous years for improving the techniques and methods of monitoring of individuals, facilities and environment, and also radiation measurement instrumentation. The research works were carried out in various fields such as radiation dosimetry, environmental monitoring, and so forth. (author).

16679 (LA-UR–95-175) **Alpha characterization of concrete surfaces at Decontamination & Decommissioning (D&D) sites.** Vu, T.Q.; Rawool-Sullivan, M.W.; Koster, J.; Stout, D.; Beasinger, A. Los Alamos National Lab., NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950216–113: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 mar 1995). Order Number DE95006331. Source: OSTI; NTIS; INIS; GPO Dep.

Waste minimization and worker protection at D&D sites requires continual and extensive characterization for radioactive contamination. Contamination detectors that are sensitive, rugged, fast, and capable of covering large areas are needed. The concrete surface monitor (CSM) developed at LANL supports both characterization and waste minimization efforts at D&D sites containing large concrete surfaces and structures of different forms and shapes. This report describes the CSM design and the results of several field experiments.

16680 (NIRS-R–25, pp. 2-6) **Characterization of elements in marine organisms.** Ishii, Toshiaki (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Characterization of elements was carried out to clarify the mechanisms of bioconcentration and the physiological roles of elements in marine organisms. The concentrations of ^{238}U in fifty-five species of marine organisms were measured by inductively coupled plasma mass spectrometry. The concentrations of ^{238}U in soft tissues of marine animals ranged from 0.076 to 500ng/g wet wt. Especially, the branchial heart of cephalopod molluscs showed the specific accumulation of ^{238}U. The concentration factor of the branchial heart of Octopus vulgaris, which indicated the highest value, was calculated to be about 10^3 by comparing it with the concentration of ^{238}U (3.2 ± 0.2ng/ml) in coastal seawater of Japan. The concentrations of ^{238}U of twenty species of algae ranged from 10 to 3700ng/g dry wt. (author).

16681 (NIRS-R–25, pp. 7-9) **$^{239,240}Pu$ and ^{137}Cs concentrations in coastal marine organisms.** Nakamura, Kiyoshi (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Nagaya, Yutaka; Yamada, Masatoshi. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Several marine biological samples were collected from the Pacific coasts of Ibaraki and Aomori Prefecture in 1987 to 1991. Ash samples were digested with hot nitric acid, and $^{239, 240}Pu$ and ^{137}Cs were purified by ion exchange processes, then their alpha and beta radioactivities were measured. $^{239, 240}Pu$ contents by coastal fishes were higher in viscera, and muscle usually showed the lowest value. On the contrary, ^{137}Cs contents were rather higher in muscle. The differences of radionuclide concentrations were found among species, but no definite regional variation was observed between the Ibaraki and Aomori coasts. $^{239, 240}Pu$ concentration in fish was not found to be a good indicator for pollution of marine environment, because it is very low. ^{137}Cs contents of pelagic fishes showed clear difference between warm water species and cold water ones. Concentrations of the radionuclides in bivalves and algae were also discussed and it was indicated that their radioactivities were high enough for radioactive pollution indicator. (author).

16682 (NIRS-R–25, pp. 14-18) **Accumulation of ^{95m}Tc by marine algae and sea urchin.** Nakamura, Ryoichi (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Nakahara, Motokazu; Matsuba, Mitsue; Suzuki, Yuzuru. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

It is necessary to investigate the accumulation of technetium by marine algae popular in Japan and it is also important to examine the contribution of food to the accumulation of the nuclide by sea urchin which grazes algae. In the laboratory tracer experiment, some species of algae and sea urchin were kept separately for 7 days in sea water containing ^{95m}Tc (uptake experiment) and then transferred into non-radioactive sea water to be held for 28 days with the frequent renewal of the sea water (excretion experiment). No food was given during the uptake experiment to prevent the urchins from accumulating ^{95m}Tc through food. Another experiment was done by feeding urchins with ^{95m}Tc labeled algae in the non-radioactive sea water. Five species of brown algae showed CFs in the range of 900 and 35000 but CFs of green and red algae were 1-4. Sea urchin accumulated more ^{95m}Tc through food (brown algae) than directly from sea water, so that the main pathway of technetium accumulation by sea urchin was estimated to be brown algae which were the most favorite food of the organism. (author).

16683 (NIRS-R–25, pp. 19-23) **Concentration parameters for radionuclides by marine molluscs.** Nakahara, Motokazu (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Makamura, Ryoichi; Suzuki, Yuzuru; Matsuba, Mitsue. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Accumulation of radionuclides from seawater and from food by marine molluscs was observed in the laboratory experiments to get bioconcentration parameters for the nuclides. The radionuclides investigated were ^{57}Co, ^{95m}Tc, ^{103}Ru, ^{137}Cs, ^{65}Zn and ^{54}Mn. Several species of molluscs containing pelecypods, gastropods and cephalopod were used for the experimental organisms. For the uptake experiment from seawater, the organisms were kept for more than seven days in radioactive seawater containing those radionuclides together. Then the organisms were transferred into nonradioactive seawater to observe the loss of the nuclides from the organisms. Biphasic loss curves were observed for all of the nuclides. Bioconcentration parameters, such as uptake rate, excretion rate, biological half-life and concentration factor at steady state were estimated from the uptake and excretion curves of the nuclides by the organisms by applying an exponential model. In the uptake experiments from radioactive food, the phytoplankton (Tetraselmis tetrathele), the brown algae (Eisenia bicyclis) and the viscera of abalone (Haliotis discus) were fed to bivalves, herbivorous gastropods and carnivorous molluscs, respectively. After single feeding of the labelled food with the nuclides, retention of the nuclides in whole body of the organisms was followed for several weeks or more. The organisms showed relatively high retention of the nuclides in whole body, except ^{137}Cs and ^{54}Mn. Retention of ^{137}Cs and ^{54}Mn in the organisms one day after feeding of radioactive food was lower than 25% of the radioactivity dosed. (author).

16684 (NIRS-R–25, pp. 24-26) **The deposition of radioiodine onto rice plant from atmosphere.** Uchida, Shigeo (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Muramatsu, Yasuyuki; Yoshida, Satoshi; Sumiya, Misako; Ohmomo, Yoichiro. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In

Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992. 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Radiation dose estimations are usually made with the aid of assessment models in which model parameters such as the transfer factors of radionuclides from one environmental compartment to another are involved. In simple models the parameters are often described as the concentration ratio of a radionuclide between two compartments, when the system is under equilibrium condition. In this paper, the authors introduce the values of the parameters of radioiodine obtained by tracer experiments. Laboratory experiments on the transfer parameters of radionuclides from the atmosphere to rice plant were carried out in the atmosphere-to-crops system (deposition pathway). It is known that the typical chemical species of gaseous iodine in the atmosphere are elemental iodine (I_2) and methyliodide (CH_3I). Deposition characteristics of both chemical species of gaseous iodine to rice grains were obtained. Mass normalized deposition velocity (V_D) and grain number normalized deposition velocity (V_S) of gaseous elemental iodine (I_2) and also methyliodide (CH_3I) on unhulled rice were measured. Both V_D and V_S of methyliodide were about one percent of those of elemental iodine. Distribution pattern of methyliodide between unhulled rice and brown rice was significantly lower than that of elemental one. For wet deposition, we investigated the retention of radioiodines (iodide [I^-] and iodate [IO_3^-]) on rice grains and their translocation from the surface of the grains to brown rice. Though the ears were dipped into the solution containing $^{125}I^-$ or $^{125}IO_3^-$ more than 15 min., both iodine species in the solutions were hardly taken up to the rice grains. Transfer rates of iodide and iodate, which are defined as 'the amount of the iodine in brown rice' divided by 'the amount of iodide in unhulled rice' were about 0.015 and 0.04. The rates were not changed with time after the radioiodine application.

16685 (NIRS-R–25, pp. 27-30) **Transfer of I-129 from soil to rice plants.** Muramatsu, Yasuyuki (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Uchida, Shigeo; Yoshida, Satoshi; Sumiya, Misako; Nakajima, Toshiyuki; Ohmomo, Yoichiro. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

When making an environmental safety assessment it therefore is necessary to study the transfer of iodine to agricultural crops. Because of high rice consumption in Japan and other Asian countries particular attention must be paid to rice plants. Radiotracer experiments on the transfer of ^{125}I (half-life 60 days) in the soil-rice plants systems have been carried out. Two typical soil types in Japan, Andosol and Gray lowland soil, were used in the experiment. The soil-plant transfer factors, which are defined as 'concentration of the nuclide in a plant organ' divided by 'concentration of the nuclide in a dry soil', were 0.002-0.0007 for brown rice (unhulled rice) and 0.5-3.2 for flag leaves. It was observed that the transfer factors were, in general, higher in Andosol than in Gray lowland soil. The ratio of radioiodine in brown rice to polished rice was about 1:0.3. The transfer factors for polished rice was estimated to be 0.001-0.002. Most of the radioiodine tracer added to the soil was absorbed by the soil phase at the beginning of the experiment. However, the iodine started to desorb into the soil solution with the growth of rice plants. This suggested that root exudates and/or artolysis might be participated in the desorption process. The iodine desorption was enhanced markedly by the addition of organic substances such as straw pieces and glucose to the soil. Eh dropped considerably after the soil was waterlogged due to microbial metabolisms. A reverse correlation was seen between the desorption ratios and soil Eh. Iodine was found to be volatilized from soil-plant system as gaseous organic iodide. Iodine emission was highly stimulated by plant cultivation.The chemical species of iodine volatilized was identified as methyl iodide (CH_3I) from gas chromatography. (J.P.N).

16686 (NIRS-R–25, pp. 31-34) **Transfer factors of technetium from soil to various agricultural products.** Yanagisawa, Kei (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Laboratory experiments of the transfer of technetium from soil to various kind of agricultural products have been carried out. The soil to plant transfer factors of Tc for rice plants were $\leq$ 0.005 for the grains and about 1.1 for the lower leaf blade. In contrast to this, higher transfer factors were found for wheat plants i.e. 0.027 for the grains (hulled) and 230 for the lower leaf blade. The Tc concentrations in the grains of both plants were lower than in the leaves. In the case of vegetables, transfer of technetium form soil to edible parts of vegetables have also been studied. Transfer factors of Tc for leaf vegetables such as spinach and komatsuna were considerably higher than those for non-leaf vegetable (e.g carrot, onion, sweet potato, tomato). Values for cabbages and Chinese cabbages were intermediate. Older leaves contained higher Tc than younger ones. It was suggested that Tc was readily taken up through roots and transported with water into leaves without any significant deposition in roots and stems. Technetium accumulated in leaves, while water was transpired from the leaves. This nuclide was associated strongly with constituents in leaves and hardly translocated into the other parts of the plants such as tubers, bulbs and fruits. The transfer factors (on a wet weight basis) in edible parts of vegetables obtained in this study were as follows; cabbage: 0.3, Chinese cabbage: 0.1, spinach: 2.4, komatsuna: 1.1, carrot: 0.3, onion: 0.05, sweet potato: 0.03 and tomato: 0.03. (author).

16687 (NIRS-R–25, pp. 41-49) **Transfer of long-lived radionuclides from diet to man and their body content and physiological characteristics of Reference Japanese Man.** Kawamura, Hisao (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office); Shiraishi, Kunio; Igarashi, Yasuhito; Yamamoto, Masayoshi; Tanaka, Gi-ichiro. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Intake and body content of actinides (Pu, Th, U) and a related alpha-emitting nuclide (Ra) were studied along with physiological aspects of Reference Japanese Man as the basic model for dosimetry. The ultimate purpose of the program was to examine applicability of the ICRP models and parameters (for workers) to members of the public. The result of an interlaboratory comparison of ^{239}Pu+^{240}Pu determination including our result was published. Alpha spectrometric determinations of ^{226}Ra in bone yielded representative adult bone concentration levels in Tokyo, 0.42 (mean) and 0.35 (median) mBq/g ash. The Ra-Ca O.R. (bone-diet) was obtained which was similar to the values in Sapporo and Kyoto. Specific effective energies for alpha radiation from ^{226}Ra and its daughters were calculated using the ICRP dosimetric model for bone and masses of source and target organs of Reference Japanese Man. Annual dose equivalents in red marrow and bone surfaces were 10 and 145 μSv as estimated from the median adult bone Ra concentration. Diet samples collected by the duplicate portion method from 31 locations in Japan in summer and winter, 1981-2 were analysed for ^{232}Th and ^{238}U by the newly developed ICP-MS technique. The daily intake per person of ^{232}Th and ^{238}U were 1.7 and 8.8 mBq, respectively. Using IDES with Japanese physical parameters and other parameters of ICRP, weighted dose equivalent commitments for single year intakes were estimated as 0.4 μSv for ^{232}Th and 0.3 μSv for ^{238}U. Reference Japanese data including the adult, adolescent, child and infant of both sexes was extensively studied by Tanaka as part of the activities associated with the ICRP Task Group on Reference Man Revision. Normal data on the physical measurements, mass and dimensions of internal organs and body surfaces and some of the body composition were analyzed in relation to the nutritional conditions of the Japanese population. (J.P.N.).

16688 (NIRS-R–25, pp. 50-55) **Experimental study on biokinetics of radionuclides in age groups.** Nishimura, Yoshikazu (National Inst. of Radiological Sciences, Chiba (Japan)); Takeda, Hiroshi; Yukama, Masae; Inaba, Jiro; Joshima, Hisamasa; Ichikawa, Ryushi. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

In the aftermath of the Chernobyl accident, it becomes evident that dose coefficients for members of the public are necessary. International Commission on Radiological Protection (ICRP) established a task group of Committee 2 charged with the assessment of dose coefficients as a function of an individual's age. However, little data is available on the biokinetics of radionuclides in juvenile and is a need to develop age-dependent biokinetic models, such as for the gastrointestinal tract. The present paper reviewed an outline on characteristics of biokinetics of radionuclides in juvenile animals focusing on the previous experimental data. The following radionuclides are discussed: ^{54}Mn, ^{60}Co, ^{65}Zn, ^{75}Se, ^{106}Ru, ^{110m}Ag, ^{115}Cd, ^{125}Sb, ^{137}Cs, ^{141}Ce, ^{203}Hg and ^{3}H. Generally, intestinal absorption and whole-body retention of radionuclides in Juveniles were higher than that of adult. In the case of sucklings, it is very important to study how radionuclides are transferred through the placenta and milk. The transfer rate of radionuclides through the placenta and milk is dependent on the period of gestation at the time of dosing. The IDES (Internal Dose Estimation System) which is based on the ICRP model was used for dose calculation. We modified the IDES using the biokinetic data which was gained by animal experiment. The IDES is flexible because the absorbed dose can be calculated by substituting arbitrary physical and physiological parameters and also substituting ingested dose coefficients not only for the ICRP Reference Man, but also for Japanese of 1 year old, 5 years old, 10 years old, 15 years old and the adult, respectively. (author).

16689 (NIRS-R–25, pp. 57-61) **Development of internal dose calculation model and the data base updated IDES (Internal Dose Estimation System).** Hongo, Shozo (National Inst. of Radiological Sciences, Chiba (Japan)); Yamaguchi, Hiroshi; Takeshita, Hiroshi; Iwai, Satoshi. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

A computer program named IDES is developed by BASIC language for a personal computer and translated to C language of engineering work station. The IDES carries out internal dose calculations described in ICRP Publication 30 and it installs the program of transformation method which is an empirical method to estimate absorbed fractions of different physiques from ICRP Reference-man. The program consists of three tasks: productions of SAF for Japanese including children, productions of SEE, Specific Effective Energy, and calculation of effective dose equivalents. Each task and corresponding data file appear as a module so as to meet future requirement for revisions of the related data. Usefulness of IDES is discussed by exemplifying the case that 5 age groups of Japanese intake orally Co-60 or Mn-54. (author).

16690 (NIRS-R–25, pp. 62-66) **Phantoms for calculations of absorbed organ dose.** Takeshita, Hiroshi (National Inst. of Radiological Sciences, Chiba (Japan)); Yamaguchi, Hiroshi; Hongo, Shozo; Iwai, Satoshi; Iwai, Kazuo. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

We have developed a computer code IDES (Internal Dose Estimation System). In this code, MIRD Transformation Method is used and photon simulation by Monte Carlo method is also possible. We have studied Japanese phantoms in two procedures, mathematical phantom and 'symbol phantoms'. Our mathematical phantoms realize their height and body weights but does not hold some of organ weights, which were measured by TANAKA and KAWAMURA. The symbol phantom can solve this discrepancy and realize a realistic phantom, although it remains problems of authorization and normalization. Errors were estimated for internal dose calculations and it was pointed out that to use realistic organ weights and parameters of kinetics was important competitively to reduce uncertainty of the results. (author).

16691 (NIRS-R–25, pp. 67-74) **Estimation of collective effective dose equivalent from environmental radiation and radioactive materials in Japan. A preliminary study.** Maruyama, Takashi (National Inst. of Radiological Sciences, Chiba (Japan)); Noda, Yutaka; Takeshita, Mitsue; Iwai, Kazuo. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

The peaceful uses of nuclear power and radiations have been developed into a stage of practical applications for human life. Radiation causes harmful effects to human beings, although human beings receives a number of invaluable benefits from the nuclear energy and the uses of radiation. In order to examine the optimization of radiation protection in these practices, collective effective dose equivalent from environmental exposures due to natural and artificial radiations have been preliminarily evaluated using most recent data. The resultant collective doses were compared with those from medical and occupational exposures. It is noted that, in Japan, the collective effective dose from environmental radiation sources can be approximately same to that from medical exposure. (author).

16692 (NIRS-R–25, pp. 75-79) **Estimation of internal dose from radiocesium and phantom.** Uchiyama, Masafumi (National Inst. of Radiological Sciences, Chiba (Japan)); Nakamura, Yuji. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

A complicated model describing the movement of a radionuclide in both the natural environment and socioeconomical systems is usually used to estimate the internal dose to the public in terms of collective dose, taking demographic data into account. The result can be certified for reliability in some compartments of the model. One of the compartments is the body content. In the case of radiocesium, the individual body burden can be measured using a whole-body counter. The measurement must be calibrated with a phantom. The public is composed of individuals of various ages. Accordingly, the whole-body counter should be calibrated with a set of phantoms approximating individuals of different body sizes. Relationships between counting efficiency and body size were analyzed on ^{137}Cs ^{134}Cs or ^{40}K incorporated into the whole-body using a set of phantoms. Four sizes covering average Japanese physiques from infant to adult male, were chosen to prepare an anthropomorphic phantom system. The distribution of ^{137}Cs in aquatic solution was homogeneous through the phantom. A whole-body counter at the National Institute of Radiological Sciences, was used at a rate of 5 cm per minute in a scanning mode. The measurements were carried out in an iron room. Relations were analyzed between counting efficiency and some anthropometric parameters. The best fit was given by a linear equation of both reciprocals of height in cm and weight in kg, with a correlation coefficient of 1.00 for ^{137}Cs. The result indicates that radioactivity of ^{137}Cs can be determined for individuals with different anthropometric parameters using the whole-body counter system. This means that effective equivalent doses for individuals can be computed accurately from the measurements. Further, an estimate on the body content from an dose estimation model using measurements of radioactivity in environmental substances can be evaluated by comparing the body burden measured. (J.P.N.).

16693 (NIRS-R–25, pp. 80-88) **A study on environmental parameters which affect external and respiratory dose.** Fujitaka, Kazunobu (National Inst. of Radiological Sciences, Chiba (Japan)); Furukawa, Masahide; Matsumoto, Masaki; Abe, Michiko; Abe, Siro. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1994. (In Japanese). In *Final report on the project research 'assessment of radiation exposure of the public to radioactivities related to the environment and food chain'. April 1988 - March 1992.* 93p. Order Number DE95747891. Source: OSTI; NTIS; INIS.

Environmental parameters which affect external and respiratory dose of the public were studied. As radon is the largest source of the public exposure, focus was put on the meteorological parameters such as air motion and rain which directly affect radon concentration in the air. The air motion was monitored through long-period observations of atmospheric ^{7}Be activity, and the size distribution of airborne radioactivities, which affects the magnitude of actual dose, was also monitored through ^{7}Be measurements by the use of low-pressure type impactors. The rain was studied mainly from a viewpoint of its scavenging effect on atmospheric radon daughters. Analyses of data obtained by a high-sensitive rainmeter along with a NaI(Tl) scintillation dosemeter showed that a large enhancement of the external radiation level is caused by wet deposition of radon daughters in the initial stage of each rain, and the increment is large when there is sufficiently a long dry period preceding the onset of the rain. Such enhancement is easily detected in case the dry period is longer than three hours. It implies that the concentration of radon daughters would recover in three hours after it is decreased by the rain scavenging. (author).

16694 (ORNL–6830) **Health and Safety Research Division. Progress report, April 1, 1993–September 30, 1994.** Berven, B.A. Oak Ridge National Lab., TN (United States). Mar 1995. 154p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009924. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Health Sciences Research Division (HSRD) is to provide a sound scientific basis for the measurement and assessment of human health impacts from radiological and chemical substances. This report summarizes the progress of the division between April 1, 1993 and September 30, 1994. In spite of a rapidly changing environment, there has been challenge, opportunity, and success during the recent 18-month reporting period. The HSRD received its 14th R7D 100 award in 1994 for Luminescence Spot Test for PCBs. In the arena of developing technology to be transferred to the private sector, the division has obtained patents on five technologies and applied for 21 invention disclosures. They have established two new Cooperative Research and development Agreements (CRADAs) with industry. Other successes and activities are presented in the appendices.

16695 (PNRI-C(AG)–94008) **Detection method for irradiated oriental fruit fly (Dacus Dorsalis) for quarantine purposes.** Yulo-Nazarea, M.T. (Health Physics Research, Philippine Nuclear Research Institute, Quezon City (Philippines)); Nato, A.Q. Philippine Nuclear Research Inst., Diliman, Quezon City (Philippines). 1994. 7p. Order Number DE95628668. Source: OSTI; NTIS (US Sales Only); INIS.

Radiation is one of the techniques used to effectively rid fresh produce of insect pests and efficacy of radiation dose on food is measured by a probit 9 (99.9968% mortality) quarantine security. Present of suitable biochemical markers for irreversible radiation injury in insect pests could be used as convincing proofs of the efficacy of radiation dose. A biochemical marker (designated Gs-protein) for radiation injury in Oriental fruit fly, Dacus dorsalis, was detected in the SDS-PAGE profile of two-day old pupae and adult insect stage. Gs-protein is not observed in larvae and eggs. An apparent molecular weight of 109 kDa was calculated. A tyrosinase enzyme activity was observed in the soluble fraction of pupal total homogenate and SDS-PAGE-isolated Gs-protein; however, no tyrosinase activity was measured in irradiated sample. The optical absorbance of the soluble fraction from unirradiated pupal total homogenate measured at 360 nm was found to increase with time. From the results of the studies, the apparent loss of Gs-protein in irradiated larvae is likely the result of loss of melanization capability in irradiated larvae which is linked to the absence of tyrosinase enzyme. The data presented seems to establish the role of Gs-protein as a biomarker for gamma-irradiation induced deactivation of pupal development and as a convenient indicator of the effectiveness of gamma radiation as a quarantine treatment. (author). 3 refs.; 3 figs.

16696 (PNRI-C(HP)–93002) **Use of a biological marker in monitoring exposures among radiation workers.** Yulo-Nazarea, M.T. (Philippine Nuclear Research Inst., Diliman, Quezon City (Philippines)); Cobar, M.L.C.; Dy, R. Philippine Nuclear Research Inst., Diliman, Quezon City (Philippines). 1993. 8p. Order Number DE95628690. Source: OSTI; NTIS (US Sales Only); INIS.

With the introduction of more modern nuclear technology in nuclear medicine, there is an increased possibility for radiation exposure among workers handling nuclear materials which calls for the autoradiographic assay of Albertini's mutation assay for hypoxanthine guanine phosphoribosyl transferase (HGPRT). An in vivo somatic mutation of HGPRT gene due to radiation exposure could be assessed using this protocol. Favorable growth of lymphocytes in culture requires activated fetal bovine serum (FBS) in RPMI 1640 medium. Phytohemagglutinin (PHA) specifically stimulates maximum proliferation of lymphocytes. Thioguanine, an anti proliferative agent, was used to screen for the presence of mutation at the HGPRT gene in which cells having mutation at the HGPRT gene locus survive the inhibitive condition. Twenty-three samples were analyzed from radiation (14) and non-radiation (9) workers. Mutation index values greater than 0.4 have been found to be higher among radiation workers (21%) than among non-radiation workers (11%). The study will facilitate the screening procedure for radiation workers and thus prevent overexposure to radiation among workers. (author.). 8 refs.; 4 tabs.

16697 (PNRI-C(HP)–94007) **Somatic mutation in peripheral blood lymphocytes among Metro Manila residents: indicator of exposure to environmental pollution.** Yulo-Nazarea, M.T. (Health Physics Research, Philippine Nuclear Research Institute, Quezon City (Philippines)); Cobar, M.L.C.; Endriga, M.A.; Sta Maria, E.J.; Nato, A.Q.; Eduardo, J.; Dy, R. Philippine Nuclear Research Inst., Diliman, Quezon City (Philippines). 1994. 8p. Order Number DE95628691. Source: OSTI; NTIS (US Sales Only); INIS.

Metro Manila is ranked as one of the world's most polluted cities where air quality levels are 2-3 times higher than the levels set by WHO. Development of diseases could be alleviated if early warning signs as occurrence of gene mutations are detected early enough. The adapted hypoxanthine guanine phosphoribosyl transferase (HGPRT) mutation assay measures the degree of mutation on the HGPRT gene and allows rapid evaluation of the occurrence of mutation in an individual exposed to radiation or mutagens within six months after exposure. The objective of the project is to (1) assay exposure of Metro Manila residents exposed to environmental pollution, (2) determine population groups significantly affected by pollutants and (3) construct an environmental baseline HGPRT mutation data bank specific to area in Metro Manila. A composite table of personal information of donors against mutation index in two barangays in Venezuela is presented. About 30% of the total samples are shown to have mutation index greater than 0.5. So far, the data show a slightly higher mutation rate among donors who are smokers with more than 5 hours outdoor exposure to pollutants per day than the corresponding class of non-smokers. (author). 5 refs.; 5 tabs.

16698 (RERF-CR–5-92) **Report of a workshop on the application of molecular genetics to the study of mutation in the children of atomic-bomb survivors.** Radiation Effects Research Foundation, Hiroshima (Japan). Sep 1993. 31p. Order Number DE95768256. Source: OSTI; NTIS; INIS.

A workshop, entitled 'application of molecular genetics to the study of mutation in the children of atomic-bomb survivors,' was held on November 12-14, 1991, which was presided over by Mortimer Mendelsohn and Toshiyuki Kumatori, co-chairmen of the RERF Scientific Council. The purpose of this workshop was to evaluate the status of the emerging DNA-oriented techniques for the study of mutation and to discuss possible developments that would bear upon the program. Although specific genetic follow-up studies of children of A-bomb survivors were addressed, it was clear to the participants that their discussions had much-wider implications –

most notably, the Chernobyl accidents of 1986. This report summarizes the contents of the lively 2.5-day meeting. A complete list of the invited participants is shown in the Appendix. (N.K.) 79 refs.

16699 (RERF-TR-8-92) **Dose survival of G_0 lymphocytes irradiated in vitro. A test for a possible population bias in the cohort of atomic-bomb survivors exposed to high doses.** Nakamura, Nori; Sposto, R.; Akiyama, Mitoshi. Radiation Effects Research Foundation, Hiroshima (Japan). Apr 1993. 16p. Order Number DE95768143. Source: OSTI; NTIS; INIS.

An in-vitro colony assay was employed for X-ray dose-survival studies of peripheral-blood lymphocytes from 117 Adult Health Study participants with Dosimetry System 1986 doses <0.005 Gy and from 84 participants with doses of ≥ 1.5 Gy. The mean (coefficient of variation) [CV] D_{10} values (the X-ray dose required to kill 90% of cells) for these two groups were 3.40 Gy (7.5%) and 3.34 Gy (7.8%), respectively. No statistically significant differences in their distributions were detected. In addition, neither sex nor age affected the in-vitro radiosensitivity of lymphocytes for either group or for all subjects combined. Therefore it was concluded that, as far as the G_0-lymphocyte colony assay is concerned, there is no evidence for preferential loss of individuals with higher cellular radiosensitivity among the high-dose atomic bomb survivors. However, it should be noted that the interindividual variations in cellular radiosensitivity were not large compared with the experimental variations. Consequently, the above-mentioned results should be considered due to the small heterogeneity of lymphocyte radiosensitivity among the survivors. (J.P.N.).

16700 (SAND-95-0138C) **Sensitivity analysis for RADTRAN 4 input parameters.** Mills, G.S.; Neuhauser, K.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950646-4: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95006899. Source: OSTI; NTIS; INIS; GPO Dep.

The transportation risk analysis code, RADTRAN 4, computer estimates of incident-free dose consequence and accident dose-risk. The output of the code includes a tabulation of sensitivity of the result to variation of the input parameters for the incident-free analysis. The values are calculated using closed mathematical expressions derived from the constitutive equations, which are linear. However, the equations for accident risk are not linear, in general, and a similar tabulation has not been available. Because of the importance of knowing how accident-risk estimates are affected by uncertainties in the input parameters, a direct investigation was undertaken of the variation in calculated accident dose-risk with changes in individual parameters. A limited, representative group of transportation scenarios was used, initially, to determine which of 23 accident-risk parameters affect the calculated accident dose risk significantly. Many of the parameters were observed to have minimal effect on the output, and others were judged as "fixed" either by regulation, convention or standards. The remaining 5 variables were selected for further study through Latin Hypercube Sampling (LHS). LHS yields statistical information from observations (risk calculations) resulting from multiple input-parameter sets compiled from "random" sampling of parameter distributions. The LHS method requires fewer observations than classical Monte Carlo methods to yield statistically significant results. This paper presents the preliminary parameter study and LHS application results together with further LHS evaluations of RADTRAN input parameters.

16701 (STUK-B-STO-29) **Use of radiation and radiation practices in 1993. Events and statistics.** Havukainen, R. (ed.). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). May 1994. 40p. Order Number DE95627832. Source: OSTI; NTIS; INIS.

In the end of the year 1993 there were in force 1740 safety licences for the use of radiation granted by the Finnish Centre for Radiation and Nuclear Safety (STUK). In addition to this there were 2100 places for dental x-ray activities in Finland. All together 12726 radiation sources and 313 radioisotope laboratories were in use. The import of radioactive substances was 3.9×10^{15} Bq and the export 2.5×10^{13} Bq. The production of short-lived isotopes was 1.3×10^{13} Bq. The monitoring of personal radiation doses was organized for 11171 workers and 1299 working places. The annual dose (the integrated readings of dosemeters) was greater than registration threshold for 24% of workers. The collective dose (the sum of the results of the dose measurements) registered to the Finnish Dose Register was 6.9 manSv; 74% belonged to the workers of nuclear power plants. The sum of the personal doses measured in 1993 were for three interventional radiologists and fifteen workers in nuclear power plants 20 mSv or more. The effective doses were in each case under the annual dose limit of 50 mSv. The effective doses for the interventional radiologists were under 20 mSv. (7 figs., 16 tabs.).

16702 (UR-102) **Index of classified reports from the University of Rochester Atomic Energy Project, January 1948 through December 1949.** Blair, H.A. Rochester Univ., NY (United States). Atomic Energy Project. 12 Jan 1950. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95009504. Source: OSTI; NTIS; GPO Dep.

This document is an index of classified reports from The University of Rochester Atomic Energy Project for the period, January 1948 to December 1949. Work was in the general area of health and biology.

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Refer also to citation(s) 15286, 15757, 16484, 16694

16703 (CONF-9409320-1) **Drought tolerance and osmotic adjustment of four deciduous tree species under altered precipitation: Preliminary results.** Shirshac, T.L. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.); Gebre, G.M.; Hanson, P.J.; Tschaplinski, T.J. Oak Ridge National Lab., TN (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Joint Society of American Foresters/Canadian Institute of Forestry national convention on physiology; Anchorage, AK (United States); 18-22 Sep 1994. Order Number DE95009132. Source: OSTI; NTIS; GPO Dep.

The degree and biochemical basis of drought tolerance and osmotic adjustment of dogwood (Cornus florida L.), white oak (Quercus alba L.), chestnut oak (Quercus prinus L.), and red maple (Acer rubrum L.) is being assessed in a mature hardwood forest using three hydrologic regimes: ambient, wet (+33% throughfall), and dry (−33% throughfall). Currently, leaf water potential, osmotic potential at saturation, and metabolite concentrations are determined monthly for trees under the three treatments. First year results show that within the dry treatment, dogwood demonstrated the highest osmotic potential at saturation (−1.2 MPa), indicating the greatest sensitivity to water stress. Increasing tolerance was evident in red maple (−1.4 MPa), white oak (−1.6 MPa), and chestnut oak (−1.9 MPa). In June, dogwood displayed a 0.12 MPa adjustment to drought, relative to the ambient control. In July, chestnut oak displayed a 0.18 MPa adjustment. This osmotic adjustment resulted primarily from fructose and glucose accumulation in dogwood, and shikimic acid and sucrose accumulation in chestnut oak.

16704 (ETDE-DE-53) **Acidification of terrestrial and aquatic ecosystems in Hessen: Causes, impacts, countermeasures.** Umweltplanung, Arbeits- und Umweltschutz. Schriftenreihe der Hessischen Landesanstalt fuer Umwelt, v. 169. Keitz, S. von. Hessische Landesanstalt fuer Umwelt, Wiesbaden (Germany); Kassel Univ. (Gesamthochschule) (Germany). Fachbereich 19 - Biologie, Chemie. 1994. 145p. (In German). Order Number DE95769152. Source: OSTI; NTIS (US Sales Only).

The work investigates the types, causes, and impact of stress from acidifying depositions on soil as well as rivers and lakes. In spite of measurable cuts in acidic depositions, far-reaching measures in the sectors of nuisance protection and forest management must be implemented in order to re-establish sound ecological cycles on a long-term basis. (MG)

16705 (ETDE-DE-73) **Signals from nature. The ten-year history of the register of ecological effects of**

Baden-Wuerttemberg. Landesanstalt fuer Umweltschutz Baden-Wuerttemberg, Karlsruhe (Germany). Oct 1994. 63p. (In German). Order Number DE95769007. Source: OSTI; NTIS (US Sales Only).

The register of ecological effects aims to weight pollutant effects in nature. In order to establish such effects, plants and animals are investigated that constitute biological indicators reacting to pollutants with visible damage or by accumulation of toxic substances. In the first part, the accumulation of inorganic pollutants (heavy metals) in different plant and animals species is investigated. In the second part, the accumulation of polycyclic aromatic hydrocarbons (PAHs), chlorinated aromatic hydrocarbons, and phthalic acid esters in different plant species is investigated. Furthermore, an investigation concept is presented by which air pollutants absorbed by filters can be tested for genotoxicity using various bioassays. In part three, reactions of vegetable and animal organisms to vapour-phase, inorganic air pollutants such as sulfur dioxide, nitrogen oxide and ozone are discussed. The pollutant sources are also mentioned in the individual sections. The development of vegetation and the condition of forest stands are discussed by means of permanent observation sites, and an investigation on organisms living in the soil (collembola) is carried through. (MG)

16706 (ETDE-DE–74) **Environmental impact and health.** Bundesministerium fuer Forschung und Technologie. Pressedokumentation, v. 18/93. Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Referat fuer Presse und Oeffentlichkeitsarbeit. 1 Dec 1993. 11p. (In German). Order Number DE95769250. Source: OSTI; NTIS (US Sales Only).

The press documentation of the BMFT (Federal Ministry of Research and Technology) presents selected examples of previous project support and interministerial working groups in short survey articles which are partly available as a brochure in a detailed form. The single subjects are 1. effects of diesel engine waste gases on the health, 2. noble metal emissions from catalytic converter vehicles, 3. dioxins, furans and polychlorinated biphenyls in the environment, 4. check of chemicals on carcinogenesis, mutagenesis, tertogenesis, 4. improvement of the air quality interior spaces, 6. the Federal Government and its Laender AG 'dioxins'. (VHE)

16707 (ETDE-DE–84) **1992 forest damage report for Hesse.** Hessisches Ministerium fuer Landesentwicklung, Wohnen, Landwirtschaft, Forsten und Naturschutz, Wiesbaden (Germany); Hessische Forstliche Versuchsanstalt, Hannoversch Muenden (Germany). Abt. Waldschaeden. 1993. 23p. (In German). Order Number DE95770347. Source: OSTI; NTIS (US Sales Only).

In its present appearance the forest shows the result of a steady decline since 1984 that has clearly become even faster during the past two years. In 1992 one third of all sample trees show marked foliar loss; one third show slight damage and only 31% are still symptom-free. In 1992 only one in ten sample trees in the age-group above 60 years show no top thinning. Every other tree in this group shows clear signs of damage. The beech is most affected by the forest decline. Only 5% of old beeches still have an intact foliage. Of all the diverse factors of influence that contribute to the appearance of trees today the weather conditions seem to have played an important role in the case of the Hessian forest ecosystems, which are also subject to a high level of anthropogenic background pollution. The recent acceleration of forest decline is also attributable to the physiological stress caused during the past few years by unusually frequent, and in 1992 particularly intense, blossom and fructification. In 1992 almost 80% of old sample trees fructified. Blossom percentage was particularly high for beech (93%) and pine (96%). In 1992 43% of old pinetrees, 42% of spruce firs, and 32% of oaks show marked damage. In the age-group below 60 years the percentages of unimpaired trees are particularly low for pinetrees and oaks. Young beeches and pinetrees, by contrast, show only minor damage; here two out of three trees are symptom-free. Yellowing is still only seen in 7% of sample trees in Hesse. Spruce firs and beeches are more affected by this than pinetrees and oaks. (orig./UWa)

16708 (GSF–7/94) **2,5-hexandione and pyrroles in human urine: Analytical determination and examination of excretion after exposure to n-hexane.** Dietz, W.G. GSF - Forschungszentrum fuer Umwelt und Gesundheit Neuherberg GmbH, Oberschleissheim (Germany). Inst. fuer Toxikologie; Technische Univ. Muenchen (Germany). Fakultaet fuer Chemie, Biologie und Geowissenschaften. 1994. 109p. (In German). Order Number DE95769224. Source: OSTI; NTIS (US Sales Only).

Biological monitoring of persons exposed to hexane used to rely on the concentration level of 2,5-hexanedione (HDO) in urine after acid hydrolysis (total HDO). However, severely acidic conditions (<1pH) cause 4,5-dihydroxy-2-hexanon, another hexane metabolite, to react to produce HDO, too, which will then be co-detected. The aim was to develop analytical methods for determining HDO in urine and to test them for their suitability for biological monitoring of hexane-exposed persons. In addition, a photometric method was to be used to study exposure-induced urinary excretion of pyrroles. Different from free HDO, total HDO appeared to be less suitable for biomonitoring since total HDO has much higher background concentrations and a slower excretion rate which will result in accumulation in cases of exposures on successive days. The diagnostic strength of this biomonitoring method is also weakened by the fact that a nontoxic metabolite is co-detected. The studies on the excretion of pyrrole compounds in urine showed these secondary metabolites to allow the verification of hexane exposure, too. (orig./Uhe)

16709 (Juel–2903) **Studies on the uptake and incorporation of anthropogenic nitrogen oxides (NO_x) by sunflowers and maize by using ^{15}N isotope tracers.** Segschneider, H.J. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Radioagronomie; Bonn Univ. (Germany). May 1994. 189p. (In German). Order Number DE95769214. Source: OSTI; NTIS (US Sales Only).

The aim of the present thesis was to quantify the uptake of nitrogen dioxide (NO_2) and nitrogen monoxide (NO) by sunflowers (Helianthus annuus L.) and maize (Zea mays L.) in a concentration range corresponding to the concentration range in the present atmosphere. Furthermore, work was carried out on characterizing the parameters responsible for NO_2 and NO uptake by varying the different exposure conditions. In addition by applying ^{15}N-enriched nitrogen oxides ($^{15}NO_2$; ^{15}NO) it was also possible to investigate the incorporation and distribution of the $^{15}NO_x$ nitrogen in the plants. After an appropriate cultivation phase, the plants were transferred individually into a specially designed exposure system (Latus, 1989). Quantification of the NO_2 or NO uptake was carried out by two independent measuring methods. On the one hand, the quantities of NO_2 or NO taken up by the plants were determined via the NO_2 concentration difference between the chamber inlet and outlet. On the other hand, the NO_2 and NO uptake was calculated after exposure to ^{15}N-enriched nitrogen oxides by determining the $^{15}N/^{14}N$ ratio in the exposed plants using mass spectrometry. Furthermore, by using various analytical procedures it was possible to determine the sizes of the different nitrogen pools in the plants and to evaluate them by mass spectrometry. (orig./UG)

16710 (KFK-PEF–113) **Soil ciliates (Protozoa: Ciliphora) as sensitive indicators of fundamental changes in forest ecosystems.** Lehle, E. (Ulm Univ. (Germany). Abt. Oekologie und Morphologie der Tiere). Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung (PEF). Nov 1993. 101p. (In German). Sponsored by Land Baden-Wuerttemberg, Stuttgart (Germany);Commission of the European Communities, Brussels (Belgium). Contract PEF 89/012/1A. Order Number DE95769244. Source: OSTI; NTIS (US Sales Only).

In spruce stands of the Black Forest with the bedrock of granite and new red sandstone and of the Swabian Alb on jura mountains (Southern Germany) the effects of fertilization, liming and treatment with composts on the ciliate fauna were investigated in laboratory microcosms. An improved culture method was tested for suitability in practice. In comparison with deciduous forests the ciliate communities of the investigated spruce stands were poor of species diversity. In the Black Forest sites liming or fertilization showed little changes in the species composition. On the Swabian Alb, in contrast, liming and treatment with compost, made from chopped wood, led to increased species numbers. In both investigated areas liming increased individual numbers. In contrast, fertilization led to no significant changes. The soil treatments caused partly clear differences in abundance and dominance structure.

Succession-cultures are suitable to certify such differences. Bacteriovorous species like Blepharisma hyalinum, Colpoda fastigata, Cyclidium muscicola, Gonostomum affine, Homalogastra setosa, Tetrahymena edaphoni increased on the limed areas. Halteria grandinella increased on the area treated with compost made from chopped wood. Soil ciliates are suitable bioindicators to characterise habitats and to analyse natural and anthropogenous changes in terrestrial ecosystems. (orig.)

16711 (UCRL-JC–119715) **Human health risks from TNT, RDX, and HMX in environmental media and consideration of the US Regulatory Environment.** Daniels, J.I.; Knezovich, J.P. Lawrence Livermore National Lab., CA (United States). Dec 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9411155–2: 1994 Luxembourg international symposium on the rehabilitation of military sites and demilitarization of explosive ordance, Kirchberg (Luxembourg), 14-18 Nov 1994). Order Number DE95009480. Source: OSTI; NTIS; INIS; GPO Dep.

Although the most economical method for disposing of unwanted energetic high explosives [HEs; e.g., 2,4,6-trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-triazine (RDX, also known as Cyclonite), and octahydro-1,3,5,7-tetrazocine (HMX, also known as Octogen)] involves open burning and open or underground detonation [OB/O(U)D]; federal, state, and even local government agencies in the United States (U.S.) are implementing stricter environmental regulations that eventually may prevent such activities. These stricter regulations will promote alternative technologies that are designed to be environmentally benign. However, past HE-waste disposal practices at manufacturing and fabrication facilities in the U.S. have included uncontrolled OB/O(U)D, as well as direct surface discharge of HE-contaminated waste water, resulting in contaminated environmental media (e.g., ground water, soil, and perhaps even edible vegetation) near residential areas. Using TNT, RDX, and HMX as examples, this paper describes how risk-based standards for HEs can be derived that account for potential multimedia exposures (associated with contaminated air, water, food, and soil) by individuals near a contaminated site, and used to (1) protect public health and safety; (2)prevent limited resources from being dedicated to unnecessary cleanup activities; and (3) identify the most cost-effective, practical, and environmentally benign technologies suitable for integrating with the handling of the large quantity of high explosives scheduled for demilitarization.

5604 Other Environmental Pollutant Effects

Refer also to citation(s) 15619, 15805

57 HEALTH AND SAFETY

Refer also to citation(s) 15618, 15668

16712 (HHS-CFR-B–9) **Risk perception and credibility of risk communication.** Sjoeberg, L. Stockholm School of Economics (Sweden). Center for Risk Research. Oct 1992. 26p. Order Number DE95627113. Source: OSTI; NTIS; INIS.

Experts and the public frequently disagree when it comes to risk assessment. The reasons for such disagreement are discussed, and it is pointed out that disagreement among experts and lack of full understanding of real risks contributes to skepticism among the public. The notion that people are in general reacting in a highly emotional and non-rational, phobic, manner is rejected. The very conditions for risk assessment present to the public, and commonsense cognitive dynamics, are better explanations of risk perception, as are some social psychological concepts. If trust is to be established in a country where it is quite low some kind of politically regulated public influence on decision making and risk monitoring is probably needed, e.g. by means of a publicly elected and responsible ombudsman. 57 refs, 8 figs, 5 tabs.

5701 Real Accidents

Refer also to citation(s) 15599, 16528

58 GEOSCIENCES

Refer also to citation(s) 14798, 14804, 14805, 14806, 15028, 15030, 15315, 16122, 16131, 16132, 16133, 16134, 16135, 16136, 16149, 16151, 16154, 16526, 16527, 16577, 16578, 17331

16713 (DOE/RF/00653–T1) **Demonstration, testing and evaluation of nonintrusive characterization technologies at operable Unit 2 of Rocky Flats Plant. Final report.** Enserch Environmental Corp., Richland, WA (United States). Sep 1994. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-93RF00653. Order Number DE95005771. Source: OSTI; NTIS; INIS; GPO Dep.

A three-dimensional (3-D), high-resolution (HR) seismic reflection evaluation was conducted at the Rocky Flats Plant (RFP), near Golden, Colorado, to demonstrate the applicability of nonintrusive characterization techniques to detect buried objects, contamination, and geological/hydrological features at RFP. The evaluation was conducted as part of the U.S. Department of Energy's (DOE) request for demonstration, testing and evaluation (DT&E) of nonintrusive techniques, under DOE Program Research and Development Announcement (PRDA) No. DE-RA05-09OR22000.

16714 (LA-UR–95-640) **Nonlinear elastic wave interaction in a sandstone bar: A summary of recent pulse-mode experiments.** Johnson, P.A. (Los Alamos National Lab., NM (United States)); TenCate, J.A.; Cherry, R.; McCall, K.; Van Den Abeele, K.; Kadish, A.; Shankland, T.; Guyer, R. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9506141–2: 15. international congress on acoustics (ICA), Trondheim (Norway), 26-30 Jun 1995). Order Number DE95007860. Source: OSTI; NTIS; GPO Dep.

We have performed nonlinear pulse propagation experiments in a 3.8 cm diameter rod of Berea sandstone 1.8 m long at ambient conditions. Unlike earlier studies, we measured acceleration and not displacement. Moreover, we detected 2nd and 3rd harmonic growth at smaller strain amplitudes than were observed previously (10^{-7}). Harmonic growth at identical strain amplitudes has also been noted in resonance studies using the same rock type. Current measurements are underway with the rod in vacuum where the wave attenuation is less and the conditions can be carefully controlled. Ultimately, we wish to test the validity of current analytic and numerical models for nonlinear propagation in microcracked materials.

16715 (NEI-DK–1912) **Cenozoic sequence stratigraphy in the eastern North Sea.** Michelsen, O.; Thomsen, E.; Danielsen, M.; Heilmann-Clausen, C.; Jordt, H.; Laursen, G.V. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 87p. Contract ENS-1313/92-0003. Order Number DE95766538. Source: OSTI; NTIS.

EFP-92.

The Cenozoic evolution of the epicontinental North Sea Basin is described on the basis of sequence stratigraphy, comprising analyses of seismic sections, petrophysical logs, and biostratigraphic studies of foraminifera, dinoflagellates, and calcareous nannofossils. Stratigraphic, palaeogeographic, and palaeoecological information from the Danish onshore area is integrated in the study. The deposits are subdivided into 21 sequences, which groups into seven informal major units. The sequence boundaries are identified by differences in seismic facies and by seismic onlap, toplap, and truncation features. The maximum flooding surface is placed at an internal downlap surface which correlates with high values on the gamma ray log. The source of sediments and the direction of sediment transport changed several times during the Cenozoic. Transport was mainly from the north during the Late Paleocene and Early Eocene, from the west during the Middle and Late Eocene, and from the north and northwest during the Oligocene to quaternary. The depocenters of the seven major units are generally located marginally, probably adjoining the source areas. There is only minor evidence for changes in subsidence rates in the basin. A constant rate is assumed from the Paleocene to the mid Middle Miocene. For the remaining part of the Cenozoic and increased rate is indicated. A tentative relative sea-level curve for the North Sea Basin is proposed. The overall trends of the curve

are broadly comparable with the global sea-level curve of Haq et al. Discrepancies may be caused by differences in the biostratigraphic calibrations. The most pronounced Oligocene sea-level fall is dated ot the latest Oligocene. (au) (83 refs.)

16716 (NEI-DK–1913) **Occurrence of major sequence stratigraphic boundaries in relation to basin development in Cenozoic deposits of the southeastern North Sea.** Michelsen, O.; Danielsen, M.; Heilmann-Clausen, C.; Jordt, H.; Laursen, G.V.; Thomsen, E. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 13p. Contract ENS-1313/92-0003. Order Number DE95766539. Source: OSTI; NTIS.

EFP-92.

The post-Danian Cenozoic succession in the southeastern North Sea is subdivided into seven informal 'major sequence stratigraphic units', comprising twenty-one sequences. The boundaries of the units are easily recognized seismic sections over the entire study area. The North Sea is an epicontinental basin. It underwent considerable changes during the Cenozoic as regards subsidence rates, direction of sediment transport, and position of depocentres. The six unit boundaries are interpreted to reflect some of the major events in the development of the basin. The boundary between units 1 and 2 (lowermost Eocene) is associated with a regional hiatus followed by a large relative sea-level rise, whereas the boundary between units 2 and 3 (Lower Eocene) coincides with a shift in the direction of sediment transport from north to west. The boundary between units 3 and 4 (Eocene-Oligocene transition) marks an important change in the depositional environment of the North Sea with a shift in the direction of sediment transport from west to mainly northeast. In the northeastern part of the study area, thick prograding deposits of unit 4 are situated on distal deposits of units 1, 2 and 3. The transition between units 4 and 5 (uppermost Oligocene) shows a pronounced basinward shift in onlap, and it is interpreted to reflect a major fall in the relative sea level. The boundary between units 6 and 7 (Middle Miocene) is identified on a shift from a prograding reflection pattern to an aggrading pattern. The lower part of unit 7 is interpreted to represent a starved depositional environment, related to a pronounced increase in subsidence rate. The North Sea sequences are correlated with the Danish onshore deposits. The sequence boundaries generally coincide with an unconformity in the Danish deposits. A glauconitic horizon characterises the initial deposits overlying each of the unconformities. (au) (29 refs.)

16717 (NEI-DK–1914) **Stratigraphic correlation of the Danish onshore and offshore Tertiary successions based on sequence stratigraphy.** Michelsen, O. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 17p. Contract ENS-1313/92-0003. Order Number DE95766540. Source: OSTI; NTIS.

EFP-92.

The results of a sequence stratigraphic study of the Tertiary sedimentary succession in the Danish North Sea sector, and the adjacent parts of the Norwegian, German, and Dutch sectors are reviewed in the present paper. Lithology and thickness variations of seven major sequence stratigraphic units, comprising twenty one sequences, are shortly described. The chronostratigraphic and genetic relationships between the North Sea sequences and the Danish onshore lithostratigraphic formations are emphasized. Six major sequence stratigraphic boundaries are pointed out, being time-equivalent with regional unconformities in the onshore area. The six surfaces bound five sedimentary packages, which are isochronous in their recognized lateral extension, and comprise genetically related deposits. It is suggested to define the five units as allostratigraphic units, and thus to create a stratigraphic subdivision, which is mappable in the southeastern North Sea region, possibly in the main part of the North Sea. The five allostratigraphic units can be identified in all areas by the available data: seismic sections and logs in the offshore area, and lithology in onshore outcrops and shallow wells. The definition of an allostratigraphic scheme would create a common nomenclature across the national borders and the present coastlines, and hopefully increase the accuracy of the chronostratigraphic correlation between profiles in the North Sea region. (au) (33 refs.)

16718 (NEI-DK–1915) **Seismic sequence stratigraphy of the Tertiary in the Danish North Sea. Incl. 7 structural maps of the main sequences, and 35 isochore maps of main sequences and smaller units.** Bidstrup, T. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 109p. Contract ENS-1313/92-0003. Order Number DE95766541. Source: OSTI; NTIS.

EFP-92.

The seismic sequence stratigraphic study presented in this paper is a part of an energy research project (EFP-91 'Basin Development of the Tertiary of the Central Trough with emphasis on possible hydrocarbon reservoirs'). The purpose of this part of the study is to identify and map Cenozoic sequences based on seismic data in the Danish North Sea sector. The identified sequence boundaries are tied to wells and correlated with log sequence stratigraphy and biostratigraphy. The boundaries of the major sequence stratigraphic units are mapped and isochore maps of the sequences have been made. Seismic key lines showing the individual sequences are presented and a short description of the individual sequences are also given. (au)

16719 (NEI-DK–1916) **Sequence and systems tract interpretation of the epicontinental Oligocene deposists in the Danish North Sea sector.** Michelsen, O.; Danielsen, M. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 29p. Contract ENS-1313/92-0003. Order Number DE95766542. Source: OSTI; NTIS.

EFP-92.

A sequence stratigraphic scheme has been established in the marine siliciclastic Cenozoic deposits in the southeastern North Sea Basin. The present paper addresses the problem of recognizing systems tracts by means of logs, using the Oligocene sequences as an example. The Oligocene sequences are characterized by an overall prograding seismic reflection pattern, and systems tracts can not be interpreted on the basis of seismic sections. The sequences are characterized by marine clay-dominated deposits, and abrupt changes in lithological facies are rarely seen. The gamma ray log trends indicate changes between retrograding, aggrading and prograding stacking patterns. The lowstand deposits are identified as prograding sedimentary bodies. Coarse-grained sharp-based lowstand deposits are found basinward of the depositional shoreline break of the preceding sequence, and further basinward they are more fine-grained. Fan deposits are not recognized. A thin interval of transgressive deposits including upward fining clayey sediments is found at the top of the lowstand deposits and in the landward direction at the top of the older highstand deposits. The maximum flooding surface is identified by a high gamma ray peak. The overlying highstand deposits thicken in the landward direction, and are here characterized by an upward coarsening trend. They thin in the basinward direction and become a condensed clay interval. Deposition took place during a tectonically quit period in an epicontinental basin with a gently southwestward dipping sea floor. The lowstand deposits are interpreted to reflect forced regression processes, and a deep ramp model is, therefore, suggested for these deposits. (au) (16 refs.)

16720 (NEI-DK–1917) **Oligocene sequence stratigraphy and basin development in the Danish North Sea sector based on log interpretation.** Danielsen, M.; Michelsen, O.; Clausen, O.R. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 42p. Contract ENS-1313/92-0003. Order Number DE95766543. Source: OSTI; NTIS.

EFP-92.

Five sequences are defined in the Oligocene succession of the Danish North Sea sector. Two of the sequences, 4.1a and 4.3, have been identified onshore Denmark. Two types of lowstand deposits are recognized, reflecting forced regression processes in an epicontinental basin. Proximally occur coarse-grained, sharp-based deposits and distally fine-grained, gradiational prograding deposits. The highstand deposits are proximally represented by thick prograding parasequence sets while they distally are characterized by thin and condensed intervals. The main sediment transport direction is from the north and the northeast. Additional sediment input

from a northern and a western direction is obsereved in two sequence. A succession of litho-facies, spanning from shallow marine, coarse-grained deposits to outer shelf clay, is mapped in each of the sequences. An overall south and southward progradation of the shoreline took place during the Oligocene, only interrupted by minor shoreline retreats. (au) (35 refs.)

16721 (NEI-DK–1920) **Stratigraphical correlation of late Paleocene sand deposits in the Soegne Basin and adjacent areas, Central North Sea.** Danielsen, M.; Clausen, O.R.; Michelsen, O. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 28p. Contract ENS-1313/92-0003. Order Number DE95766546. Source: OSTI; NTIS.

EFP-92.

A stratigraphic analysis of Late Paleocene sands of the Soegne Basin and the western part of the Norwegian-Danish Basin shows that the sand bodies are of different ages. The geographic distribution of the sand deposits shows that they are related to underlying Mesozoic structures suggesting a controlling effect of Tertiary tectonics on the deposition of sand during the Late Paleocene. However, the structural setting of various sand bodies varies from reactivation of older faults and reactivation of salt structures. The local character of the structures active during the Late Paleocene introduces minor depressions with no lateral connection. The sand bodies, which are interpreted as deposited in these depressions, are thus in general separate bodies with no lateral connection. The Fennoscandian shield and eroded Mesozoic sediments along the Fennoscandian Border Zone are suggested as source ares for the Late Paleocene sand deposits. (au) (39 refs.)

16722 (NEI-DK–1921) **Transitional Palaeocene-Eocene ash bearing diatomite in the eastern North Sea.** Thomsen, E.; Danielsen, M. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 10p. Contract ENS-1313/92-0003. Order Number DE95766527. Source: OSTI; NTIS.

EFP-92.

The lithology and log pattern of the Palaeocene/Eocene ash series from several wells in the northeastern part of the North Sea is described. In five of the investigated wells, the ash beds are interbedded with a diatomite which is apparently rather similar to the diatomaceous Fur Formation in northwestern Jutland. The five wells are situated in a belt stretching from the coast of Jutland towards the northwest along the southern coast of Norway, thus forming a natural continuation of the onshore diatomite. The thickness of the diatomite varies considerably, but it seems, in general, to be thinner in the North Sea than in Jutland, where the maximum thickness approaches 60 m. (au) (16 refs.)

16723 (NEI-DK–1924) **Tertiary fluvial deposits of Jylland, Addit area.** Hansen, H.C.S. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 24p. Contract ENS-1313/92-0003. Order Number DE95766530. Source: OSTI; NTIS.

EFP-92.

Sandy fluvial deposits of Tertiary age are described from three sand pits in the Addit area with up to 28 metres high outcrops. The deposits form up to 20 metres thick, fining-upwards successions of mainly large-scale, tabular cross-sets of medium and coarse-grained sand interpreted as fluvial bars. The successions are capped by thinly interbedded sands and silts and occasionally overlain by a coal bed. Concave-up bounding surfaces separate the fining-upwards successions. Channel switching, breaks in active channel aggradation, rapid scour- and filling events and chute activity created bounding surfaces that are described by a 4-tier hierarchy. The palaeocurrents derived from trough forests suggest that the channel course was straight rather than sinuous. The current directions were generally to the south and southwest. (au) (43 refs.)

16724 (NEI-DK–1925) **Low-sinuosity river deposits from the Middle Miocene quarts sands of Jylland.** Hansen, H.C.S. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 26p. Contract ENS-1313/92-0003. Order Number DE95766531. Source: OSTI; NTIS.

EFP-92.

Tertiary, very pure quartz sand deposits in central Jylland are well known by the aggregates industry. The quartz sand deposits have been referred to the Odderup Formation. The industry presently exploits the quartz sands in five pits situated on the rim of the Gudenaa valley near the villages of Addit and Voervadsbro. This report will show that the environment of deposition was a sand-rich, low-sinuosity river situated on an upper delta plain. The detailed interpretation of structures and processes will show the unequivocal fluvial nature of the Odderup Formation at Voervadsbro and Addit. Water stage variations of a river governed the formation of bedforms and characteristic successions of facies were produced. Excellent examples of deposits of fluvial bars are exposed in three of the pits. (au) (34 refs.)

16725 (NEI-DK–1926) **Contribution to the meeting 'Stratigraphy of the Paleocene'.** Thomsen, E.; Heilmann-Clausen, C.; Ali, J.R.; Abrahamsen, N. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 8p. Contract ENS-1313/92-0003. Order Number DE95766532. Source: OSTI; NTIS.

EFP-92.

The purposes of the present review are (1) to discuss the Paleocene stage boundaries relative to the current dinoflagellate zonation of the North Sea region. (2) to point out some dinoflagellate events which have proven to be reliable for correlation within the region and (3) to evaluate the possible use of these events for correlation to other regions of the world. The dinoflagellates are the single fossil group which has contributed most to the present day biostratigraphical resolution of the Paleocene in the North Sea Basin. This is especially the case in the Selandian and Thanetian where most other fossil groups are restricted to certain stratigraphical intervals or lithologies. (au)

16726 (NEI-DK–1927) **Paleogene radiolaria and diatoms from three exploration wells from the Central Graben, North Sea (Danish Sector): stratigraphic and palaeoenvironmental significance.** Jutson, D. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 104p. Contract ENS-1313/92-0003. Order Number DE95766533. Source: OSTI; NTIS.

EFP-92.

The results from the biostratigraphic analyses of radiolarian, and foraminiferal microfaunas and diatom microfloras from the Paleogene interval of three wells from the North Sea are presented in this report. The wells used in the study were Mona-1, Bertel-1 and Iris-1, all from the Danish Sector. The aim of the study was to record and taxonomically determine radiolaria and diatoms and to compare their distribution with established foraminiferal zonations to estimate their potential for enhancing stratigraphic and paleoenvironmental interpretations as part of the EFP-92 Tertiaer Bassinudvikling project. (au) (3 maps., 38 refs.)

16727 (NEI-DK–1928) **Linde-1 borehole: Paleogene dinocysts, palynofacies and stratigraphy.** Heilmann-Clausen, C. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 44p. Contract ENS-1313/92-0003. Order Number DE95766534. Source: OSTI; NTIS.

EFP-92.

The Linde-1 borehole is situated in western Jylland. It was drilled on the Linde salt-structure in 1979-80 in order to investigate the possibility of using the salt for disposal of nuclear waste material. The salt turned out to occur at a much deeper level than expected. However, the borehole yields useful information on the stratigraphy in western Jylland. The results from Linde-1 are given in three reports. The present report is primarily a biostratigraphical analysis. It covers the entire Paleogene (except lower-middle Danian) and is based on dinocysts of side-wall cores and cores. It is the first documentation of dinocyst distribution in the upper Paleogene of Denmark. Further, the report presents a lithostratigraphical and chronostratigraphical interpretation of the section. A brief palynofacies description and palaeoenvironmental interpretation is also

included. Finally the position of the North Sea sequence boundaries, as determined on the basis of the borehole data, and the meager results of the seismic study are shortly reported. Two separate reports contain foraminifera and calcareous nannofossil results of the upper Paleogene. (EG) (6 maps., 23 refs.)

16728 (NEI-DK–1929) **Ecocene and Oligocene calcareous nannofossil biostratigraphy in the Linde-1 and Borg-1 boreholes.** Thomsen, E. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 17p. Contract ENS-1313/92-0003. Order Number DE95766535. Source: OSTI; NTIS.

EFP-92.

The Linde-1 and Borg-1 boreholes are located in western Jutland in an area intermediate between the Cenozoic outcrops of northern and eastern Jutland and the wells in the eastern North Sea. They are important in order to establish a correlation between the sequence stratigraphy subdivision of the North Sea and the lithological subdivision of the Danish land area. Linde-1 is situated about 10 km northwest of Holstebro, Borg-1 about 10 km north of Toender and some 160 km south of Linde-1. Geologically, Linde-1 is situated on a deep salt pillow in the Danish subbasin close to the northern flank of the Ringkoebing-Fyn High, while Borg-1 is situated on the southern flank of the Ringkoebing Fyn High. This report presents the results of a biostratigraphical analysis on the basis of calcareous nannofossils of the Middle Eocene to Oligocene successions in the Linde-1 and Borg-1 boreholes. The results are compared with the Viborg-1 borehole and with boreholes from the northeastern part of the North Sea. (au) (12 refs.)

16729 (NEI-DK–1930) **Foraminiferal biostratigraphy of Cenozoic sections in five wells from the Danish area.** Laursen, G.V. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 67p. Contract ENS-1313/92-0003. Order Number DE95766536. Source: OSTI; NTIS.

EFP-92.

Information outlines the foraminiferal zonation and age determination in five Danish wells and the environmental changes in terms of water depth oscillations which took place in the Danish area during parts of the Cenozoic. The foraminifera reflect the general alternations in the water depth: the water depth increased from a middle to outer neritic environment in the Paleocene to an outer neritic to upper bathyal environment in the Eocene in the C-1 well. This environment generally remained stable through the transition between Eocene and Oligocene and into the Lower Oligocene. The high amount of planktic foraminifera indicate an open oceanic connection. A decrease in water depth is observed in the Lower Oligocene NSB 7b where the foraminifera indicate an environment of the inner part of the outer neritic. The foraminifera of the Upper Oligocene indicates the inner part of the outer neritic environment, but the water depth seem to decrease in the uppermost part of the Oligocene. The high relative sea level is supported by the wide geographical distribution even on the structural high (Ringkoebing-Fyn High) of Subzones NSB 8a and 8c. (au) (6 maps., 26 refs.)

16730 (NEI-DK–1931) **Correlation of Miocene North Sea sequences with the Danish land area based on foraminifera.** Laursen, G.V.; Kristoffersen, F.N. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 14p. Contract ENS-1313/92-0003. Order Number DE95766520. Source: OSTI; NTIS.

EFP-92.

In the present study comparisons are made between the Miocene North Sea sequences and the Danish onshore formations based on foraminiferal biostratigraphy. Foraminiferal faunas of four onshore borings previously analyzed have been reviewed. Biozones NSB 9 - NSB 13 of the offshore sequences were all found in the Danish Miocene formations, and the obtained results promise well for a future more detailed correlation between the North Sea and the Danish land area. (au)

16731 (NEI-DK–1932) **Detailed foraminiferal biostratigraphy of the Danish marine Miocene formations.** Laursen, G.V.; Kristoffersen, F.N. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 51p. Contract ENS-1313/92-0003. Order Number DE95766521. Source: OSTI; NTIS.

EFP-92.

The Miocene strata of eighteen boreholes from onshore Denmark have been investigated for their foraminiferal content. A dense sampling with intervals of about 0.5 metres has resulted in a very detailed biostratigraphy. Some of the boreholes were analyzed in detail, others just examined for similarities in the faunal pattern. It was possible to apply the established North Sea zonations in the present study, and owing to the dense sampling it has been possible to confirm, refine and improve these zonations. Hence, some of the established benthic zones can now be further subdivided. Furthermore, some substitute markers are introduced for as well the benthic as the planktic zonation. The chronostratigraphical allocation of the zones is reinterpreted in light of recent publications. The data showed several oscillations in the water depth during the Miocene and a correlation of these with the sequence stratigraphical framework of the Danish North Sea area is attempted. (au) (62 refs.)

16732 (NEI-DK–1933) **Neogene and Quaternary dinoflagellate cyst biostratigraphy and paleoclimatology of the Karl-1 borehole, Central Trough in the Danish North Sea area.** Poulsen, N.E. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 61p. Contract ENS-1313/92-0003. Order Number DE95766522. Source: OSTI; NTIS.

EFP-92.

The dinoflagellate cysts of Miocene-Quaternary beds of the Karl-1 borehole, Danish North Sea sector were studied for biostratigraphy and paleoecology. This report provide a revision of the dinoflagellate cyst biozonation for the Neogene-Quaternary of Costa and Manum. The revised dinoflagellate cyst zonation is used in the biostratigraphic description of the Karl-1 borehole. Paleoecological interpretations (paleodepth, paleotemperature, paleosalinity) based on dinoflagellate cysts are described in detail for the sidewall cores within the interval 6200-4200 feet. The Miocene was found to have been deposited in an outer neritic-oceanic paleoenvironment; the sea level apparently rose to a maximum near the Tortonian-Messinian boundary. The sea temperatures in the Early-Middle Miocene were subtropical, whereas the Late Miocene shows falling sea temperatures. (JT) (2 maps., 62 refs.)

16733 (NEI-DK–1934) **Neogene and Quaternary dinoflagellate cyst, foraminiferal, and molluscan biostratigraphy and paleoclimatology and paleoenvironment of the Lille Toende borehole, southern Jylland, Denmark.** Poulsen, N.E.; Laursen, G.V.; Rasmussen. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 51p. Contract ENS-1313/92-0003. Order Number DE95766523. Source: OSTI; NTIS.

EFP-92.

The Miocene beds of the Lille Toende borehole, southern Jylland (Denmark) was studied by means of dinoflagellate cysts, foraminifers, and molluscs. The biostratigraphy based on the three different fossil groups is compared, and correlations with northwest European and international standard chronostratigraphic units is attempted. This dates the northwest European 'Middle Miocene' as older than the standard Middle Miocene. Paleoecological interpretations (paleodepth, paleotemperature, paleosalinity) based on dinoflagellate cysts and foraminifers is described in details. The Arnum formation was found to have been deposit in an inner neritic environment, possibly with reduced salinity, and with subtropical sea temperatures, the winter surface temperatures was found to above 10 deg. C. The Hodde Formation and the Middle Miocene part of the Gram Formation was deposit under middle-outer neritic paleoenvironmental conditions and with fairly similar paleotemperatures. The Late Miocene part of the Gram Formation was deposit under outer neritic paleoenvironment conditions, but possibly under falling sea temperatures. Apparently, the sea level did in general rise until it reached a maximum near Tortonian-Messinian boundary. (au) (1 map, 84 refs.)

16734 (NEI-DK–1935) **Foraminiferal biostratigraphy of the post mid-Miocene in two boreholes in the Danish North Sea.** Konradi, P.B. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks

Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 22p. Contract ENS-1313/92-0003. Order Number DE95766524. Source: OSTI; NTIS.

EFP-92.

Cutting samples from two exploration wells, Cleo-1 and Kim-1, in the central Trough area in the northwestern part of the Danish North Sea, have been investigated for foraminiferal content in the section above the prominent mid-Miocene event. Benthonic foraminifera have been used to produce a stratigraphic subdivision by reference to the standard NSB zonation of King. The NSB 12 to NSB 17 zones (Middle Miocene to Middle Pleistocene) have been identified above the event. These zones can be related to the paleo water depth zonation. Paleoenvironmental reconstruction shows that sediments from the subject interval from Cleo-1 were deposited in a shallower situation than equivalent deposits in Kim-1. A conspicuous hiatus is identified in Cleo-1 at the Pliocene-Pleistocene boundary. (au) (12 refs.)

16735 (NEI-DK–1936) **Foraminiferal biostratigraphy of the post mid-Miocene in the Danish Central Trough, North Sea.** Konradi, P.B. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 21p. Contract ENS-1313/92-0003. Order Number DE95766525. Source: OSTI; NTIS.

EFP-92.

The foraminiferal content of ditch cutting samples from three exploration wells in the Danish North Sea has been investigated in the sections above the mid-Miocene marker. The wells are Cleo-1, situated at the edge of the Central Trough, Kim-1 and M-10 situated in the central part of the trough, in the northern and the southern part, respectively. Based on analysis of the benthic foraminiferal faunas, the strata in the boreholes are primarily subdivided in accordance with the standard North Sea zonation. The Kim-1 well only has a continous marine series, whereas the M-10 well and the Cleo-1 well displays hiatuses. The interpretations of the faunal assemblages indicate the oldest strata to be deposited in an open marine, outer shelf environment. Uphole through the wells, the content of planktic species diminishes gradually; the benthic assemblages indicate shallowing water depth reaching an inner shelf to littoral environment. This is interpreted to reflect the filling of the North Sea basin through the Middle to Late Miocene and Pliocene. The faunas in the Pleistocene deposits indicate an inner shelf to littoral environment, with periods of reduced salinity and non-marine sedimentation. (au) (14 refs.)

16736 (NEI-DK–1937) **Numerical biostratigraphy and depositional environments: benthic microfaunas in the Tertiary (Neogene) clastic sequence, Danish North Sea.** Stouge, S.; Laursen, G.V.; Konradi, P.B. Aarhus Univ. (Denmark). Geologisk Inst.; Danmarks Geologiske Undersoegelske, Copenhagen (Denmark). 1995. 157p. Contract ENS-1313/92-0003. Order Number DE95766526. Source: OSTI; NTIS.

EFP-92.

As part of the Tertiary project 'EFP-92' microfauna are used as palaeoenvironmental indicators for the Neogene of the Danish North Sea. Three wells, Cleo-1, Mona-1 and Kim-1, in the North Sea were sampled and investigated in detail for the microfauna content and treated using multivariate analysis methods. The constrained biostratigraphic analysis based on benthic foraminifera species recorded from the three wells provides a basis for a detailed zonation and a hierarchy of zones, subzones and faunas through the Neogene is obtained. Results of the biotope/biofacies analysis are that the fauna can be described as communities with a bathymetrical trend through time and the region is characterized by a change from bathyal environmental communities to shallow water communities. The occurrence and migrations of the biofacies from the Cleo-1 to Mona-1 to Kim-1 correspond with the results obtained from the seismic interpretation. Several biofacies of great importance in the Danish North Sea seem predimonantly to have their limit of distribution in terms of depth, although lateral segregation may be revealed in few cases. (au) (62 refs.)

16737 (Y/EN–4683) **Seismic hazard evaluation for Department of Energy Oak Ridge Reservations, Oak Ridge, Tennessee.** McGuire, R.K. (Risk Engineering, Inc., Golden, CO (United States)); Toro, G.F.; Hunt, R.J. Oak Ridge Y-12 Plant, TN (United States); Risk Engineering, Inc., Golden, CO (United States). 30 Sep 1992. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95009053. Source: OSTI; NTIS; GPO Dep.

This study presents the results of an investigation of seismic hazard at the Department of Energy Oak Ridge Reservations (K-25 Site, Oak Ridge National Laboratories, and Oak Ridge Y-12 Plant), located in Oak Ridge, Tennessee. Oak Ridge is located in eastern Tennessee, in an area of moderate to high historical seismicity. Results from two separate seismic hazard analyses are presented. The EPRI/SOG analysis uses the input data and methodology developed by the Electric Power Research Institute, under the sponsorship of several electric utilities, for the evaluation of seismic hazard in the central and eastern United States. The LLNL analysis uses the input data and methodology developed by the Lawrence Livermore National Laboratory for the Nuclear Regulatory Commission. Both the EPRI/SOG and LLNL studies characterize earth-science uncertainty on the causes and characteristics of earthquakes in the central and eastern United States. This is accomplished by considering multiple hypotheses on the locations and parameters of seismic source zones and by considering multiple attenuation functions for the prediction of ground shaking given earthquake size and location. These hypotheses were generated by multiple expert teams and experts. Furthermore, each team and expert was asked to generate multiple hypotheses in order to characterize his own internal uncertainty. The seismic-hazard calculations are performed for all hypotheses. Combining the results from each hypothesis with the weight associated to that hypothesis, one obtains an overall representation of the seismic hazard at the Oak Ridge site and its uncertainty.

66 PHYSICS

Refer also to citation(s) 15677

6611 Classical and Quantum Mechanics

16738 (IC–94/393) **BFV quantization on hermitian symmetric spaces.** Fradkin, E.S.; Linetsky, V.Ya. International Centre for Theoretical Physics, Trieste (Italy). Dec 1994. 25p. Order Number DE95628161. Source: OSTI; NTIS (US Sales Only); INIS.

Gauge-invariant BFV approach to geometric quantization is applied to the case of hermitian symmetric spaces G/H. In particular, gauge invariant quantization on the Lobachevsky plane and sphere is carried out. Due to the presence of symmetry, master equations for the first-class constraints, quantum observables and physical quantum states are exactly solvable. BFV-BRST operator defines a flat G-connection in the Fock bundle over G/H. Physical states are covariantly constant sections with respect to this connection and are shown to coincide with the generalized coherent states for the group G. Vacuum expectation values of the quantum observables commuting with the quantum first-class constraints reduce to the covariant symbols of Berezin. The gauge-invariant approach to quantization on symplectic manifolds synthesizes geometric, deformation and Berezin quantization approaches. (author). 28 refs.

16739 (IC–95/36) **Infinite set of relevant operators for an exact solution of the time-dependent Jaynes-Cummings Hamiltonian.** Gruver, J.L. (International Centre for Theoretical Physics, Trieste (Italy)); Aliaga, J.; Cerdeira, H.A.; Proto, A.N. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 63p. Order Number DE95628162. Source: OSTI; NTIS (US Sales Only); INIS.

The dynamics and thermodynamics of a quantum time-dependent field coupled to a two-level system, well known as the Jaynes-Cummings Hamiltonian, is studied, using the maximum entropy principle. In the framework of this approach we found three different infinite sets of relevant operators that describe the dynamics of the system for any temporal dependence. These sets of relevant operators are connected by isomorphisms, which allow us to consider the case of mixed initial conditions. A consistent set of initial conditions is established using the maximum entropy principle density operator, obtaining restrictions to the physically feasible initial conditions of the system. The behaviour of the population inversion is shown for different time dependencies of the Hamiltonian

and initial conditions. For the time-independent case, an explicit solution for the population inversion in terms of the relevant operators of one of the sets is given. It is also shown how the well-known formulas for the population inversion are recovered for the special cases where the initial conditions correspond to a pure, coherent, and thermal field. (author). 35 refs, 9 figs.

16740 (IC–95/37) **The second variation and Jacobi equations for second-order Lagrangians.** Casciaro, B. (Bari Univ., Bari (Italy). Dipt. di Matematica); Francaviglia, M.; Tapia, V. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 19p. Order Number DE95628915. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the Jacobi equation ensuing from the second variation of second-order actions which contain acceleration. The same is done for field theory. (author). 13 refs.

16741 (IC–95/44) **Schroedinger covariance states in anisotropic waveguides.** Angelow, A. (International Centre for Theoretical Physics, Trieste (Italy)); Trifonov, D. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 15p. Order Number DE95628917. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper Squeezed and Covariance States based on Schroedinger inequality and their connection with other nonclassical states are considered for particular case of anisotropic waveguide in $LiNiO_3$. Here, the problem of photon creation and generation of squeezed and Schroedinger covariance states in optical waveguides is solved in two steps: 1. Quantization of electromagnetic field is provided in the presence of dielectric waveguide using normal-mode expansion. The photon creation and annihilation operators are introduced, expanding the solution A-vector(r-vector,t) in a series in terms of the Sturm - Liouville mode-functions. 2. In terms of these operators the Hamiltonian of the field in a nonlinear waveguide is derived. For such Hamiltonian we construct the covariance states as stable (with nonzero covariance), which minimize the Schroedinger uncertainty relation. The evolutions of the three second momenta of q-circumflex$_j$ and p-circumflex$_j$ are calculated. For this Hamiltonian all three momenta are expressed in terms of one real parameters s only. It is found out how covariance, via this parameter s, depends on the waveguide profile n(x,y), on the mode-distributions u-vector$_j$(x,y), and on the waveguide phase mismatching $\Delta\beta$. (author). 37 refs.

16742 (JINR-E–2-94-359) **The Eulerian Bound States: 5D Coulomb Problem.** Karayan, Kh.G.; Mardoyan, L.G.; Ter-Antonyan, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 12p. Order Number DE95627119. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Teoreticheskaya i Matematicheskaya Fizika.

The Eulerian coordinates are applied for analyzing the 5D hydrogen atom's bound states problem. We calculate the spherical and parabolic bases of the 5D Coulomb problem, derive the Park's and Tarter's representations for the coefficients of the spherical-parabolic and parabolic-spherical interbasis expansions. We established also the trinominal recurrent relations for the generalized Coulson-Joseph's amplitudes. 11 refs.

16743 (JINR-E–2-94-425) **The Electromagnetic Field of Elementary Time-Dependent Toroidal Sources.** Afanas'ev, G.N. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Stepanovskij, Yu.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 22p. Order Number DE95628163. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Physics. A, Mathematical and General.

The radiation field of toroidal-like time-dependent current configurations is investigated. Time-dependent charge-current sources are found outside which the electromagnetic strengths disappear but the potentials survive. This can be used to carry out time-dependent Aharonov-Bohm-like experiments and the information transfer. Using the Neumann-Helmholtz parametrization of the current density we present the time-dependent electromagnetic field in a form convenient for applications. 17 refs.

16744 (JINR-E–2-94-439) **The Eulerian Bound States: 8D Quantum Oscillator.** Karayan, Kh.G. (Erevanskij Gosudarstvennyj Univ., Erevan (Armenia)); Mardoyan, L.G.; Ter-Antonyan, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 12p. Order Number DE95628164. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Teoreticheskaya i Matematicheskaya Fizika.

The Eulerian coordinates are applied for analyzing the 8D oscillator bound states problem. We construct the spherical and cylindrical bases, derive two types of representations for the coefficients of the spheric-cylindrical and cylindric-spherical inter basis expansions, and establish the tri nominal recurrent relations for the amplitudes generating the spheroidal basis of the 8D oscillator. 8 refs.

16745 (JINR-E–4-94-426) **Resonance Phenomenon as a Transmutation of the Quasienergy Spectrum.** Skoblin, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 7p. Order Number DE95628165. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. A.

The following well-known paradox is considered. On one hand, for each quantum system with a time-periodic Hamiltonian, solutions of the Schroedinger equation exist which are time-periodic functions modulated by the factor e^{-iEt}. On the other hand, the amplitude of a harmonic oscillator, acted upon by a time-periodic force with a resonant frequency, increases with time for any initial condition. The paradox is resolved with the help of the exact solution of the corresponding Schroedinger equation. It is shown that the paradox arises, if one does not take into account the transmutation of the quasienergy spectrum and of the steady states (quasienergy states) basis in a resonant point. 12 refs.

16746 (JINR-E–11-90-204, pp. 10) **An example of an use-written extension package to the REDUCE computer algebra system for calculations in physics.** Warns, M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUANTUM OPERATORS/computer codes; COMPUTERIZED SIMULATION

16747 (JINR-E–11-90-204, pp. 14-15) **Operator ordering and G-quantization schemes in computer algebra symbol representation of enveloping algebras.** Lassner, W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIE GROUPS/mathematical operators; LIE GROUPS/quantization; QUANTIZATION; PHASE SPACE; WEYL UNIFIED THEORY

16748 (JINR-E–11-90-204, pp. 15) **Automatic calculation of scattering amplitudes.** Kaneko, T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SCATTERING AMPLITUDES/computer codes; SCATTERING AMPLITUDES/perturbation theory; FEYNMAN DIAGRAM

16749 (JINR-E–11-90-204, pp. 49) **Differences of roots of polynomials and solutions of ODE.** Galiev, V.I.; Polupanov, A.F.; Shparlinskij, I.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.*

95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HAMILTONIANS/polynomials; HAMILTONIANS; POLYNOMIALS

16750 (JINR-E–11-90-204, pp. 72-73) **Application of computer algebra to analysis of necessary integrability conditions for polynomial-nonlinear evolution equations.** Gerdt, V.P. (and others); Khutornoj, N.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. KORTEWEG-DE VRIES EQUATION/ nonlinear problems; ALGORITHMS; R CODES

16751 (JINR-E–11-90-204, pp. 80-81) **Program for the analytical construction of the Birkhoff-Gustavson normal form.** Wolf, K.B.; Krotzch, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HAMILTONIANS/transformations; HAMILTONIANS; TRANSFORMATIONS; R CODES

16752 (JINR-R–4-94-441) **Density Matrix and Transformation of Slow Neutron Beams.** Nosov, V.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Frank, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 18p. (In Russian). Order Number DE95628166. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zhurnal Ehksperimental'noj i Teoreticheskoj Fiziki.

The question raised in the literature regarding the possibility of recognizing pure and mixed states in a beam of nonrelativistic particles is analyzed in terms of its density matrix. A specific theory of the phenomenon has been developed. In the general case, the beam occurs with a modulated density: from the kinematics standpoint, waves which resemble sound waves,are propagated along the beam.They have a discrete spectrum. The lower bound on the wavelength has a purely quantum origin and is determined by the coherence length which is many times larger than the De Broglie length under good beam monochromatization. In theory, the feasible and practical ways of realizing cold neutron beam transformation have been found which could extend the length and diminish the frequency of the corresponding modulation wave propagating in the beam. The immediate possibilities of the experiment are considered. 22 refs.

16753 (JINR-R–4-94-448) **Tunneling between Two Inequivalent Wells.** Zastavenko, L.G.; Zakhar'ev, B.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. (In Russian). Order Number DE95628167. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to American Journal of Physics.

An instructive analysis of the motion of the wave packet constructed of two bound states in two different potential wells is given. In contrast with the case of equivalent wells the packets don't go completely from one well to another (as is often erroneously stated, e.g. in 'Am.J.Phys.', 1992, 60, 88). Only a fraction of packets takes part in this inter-well tunneling and this fraction is the less the far from one another are the wells and the more is the difference between the wells. The phenomenon of the wave packet tunneling ('jumps') through the potential wells is discovered. 11 refs., 6 figs.

16754 (JINR-R–4-94-461) **Unexpected Annihilation of States when Bringing Together (Degenerating) the Energy Levels.** Zakhar'ev, B.N.; Chabanov, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. (In Russian). Order Number DE95628168. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review Letters.

Unexpectedly it turned out that when drawing together the levels of two bound states on an initial potential well these states 'disappear': corresponding wave functions are either carried away with auxiliary wells to infinity in both directions on the whole axis or pressed into the vertical potential walls (in the case of reference infinite rectangular well). All the functions of other levels in the remaining part of the well constitute a complete set. In the case of unsymmetrical potentials there can happen effective disappearance of one state of the doublet. 6 refs., 8 figs.

16755 (SAND–95-0095C) **The development and application of massively parallel solid mechanics codes.** McGlaun, M.; Robinson, A.; Peery, J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950788–1: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95006307. Source: OSTI; NTIS; GPO Dep.

Computational physicists at Sandia National Laboratories have moved the Eulerian CTH code, and the arbitrary-Lagrangian-Eulerian ALEGRA code to distributed memory parallel computers. CTH is a three-dimensional solid mechanics code used for large-deformation, shock wave analysis. ALEGRA is a three-dimensional arbitrary Lagrangian-Eulerian solid-mechanics code used for coupled large-deformation, shock and structural mechanics problems. This paper discusses our experiences moving the codes to parallel computers, the algorithms we used and our experiences running the codes.

6612 Techniques of General Use in Physics

16756 (BNL–61149, pp. 48-58) **Study of static and dynamic effects in gas targets.** Tarkanyi, F. (Institute of Nuclear Research of the Hungarian Academy of Sciences, Debrecen (Hungary)); Takacs, S.; Heselius, S.J.; Solin, O.; Bergman, J. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Gas targets play key roles in different fields of science and technology. The penetration of energetic charged particles into high pressure gas targets has been studied by several groups to optimize the radionuclide and neutron production using thin and thick gas targets, as well as in the field of investigation of charged particles and neutron induced nuclear reactions. To study the interaction of charged particles with gaseous material several experimental methods have been developed on the basis of measurement of the activity of the produced radioisotopes, secondary neutrons, heat, charge, emitted light, change of density, temperature, refractory indexes etc. The obtained results were mainly interpreted qualitatively using different phenomenological models. Only a few groups made systematic study of the interaction of charged particle beams and gas targets and still many questions remain open. This work was initiated by the optical study of gas targets made at Abo Akademi, Turku, Finland, and by the experimental results of excitation functions and production yields obtained in Debrecen, using gas targets at horizontal and vertical irradiation arrangement. The high speed video technique and charge distribution measurement allowed the study of both the transient effects of the beam penetration into gaseous targets, and the final equilibrium states of the beam in the targets at horizontal and vertical beam lines. An effort was made to explain the results phenomenologically.

16757 (BNL–61149, pp. 119-120) **Heat transport in targets and what it means to me.** Nickles, R.J. (Univ. of Wisconsin, Madison, WI (United States)). Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The author suggests, in colloquial fashion, that the temporal profile of the ion beam might be of interest in the study of heat transport from targets. He cites several personal examples.

16758 (BNL–61149, pp. 134-139) **Modeling of target thermal properties for the BLIP upgrade.** Mausner, L.F. (Brookhaven National Lab., Upton, NY (United States)); Hock, J.C.; Kolsky, K.L.; Tuozzolo, J.E. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

The authors anticipate imminent approval to upgrade the Brookhaven Linac Isotope Producer (BLIP). This is an interim measure to improve availability of some accelerator produced radionuclides during the period while LAMPF operations phase out until the construction of the ambitious National Biomedical Tracer Facility (NBTF). The goals of this two year effort are to (1) increase the average proton beam current by a factor of 2.3 to a maximum of 145 μA at 200 MeV, (2) increase operations to 46 weeks per year with 90% beam availability (1.5d/month maintenance $\sim$ 5% + 5% downtime), and (3) undertake production of several radionuclides presently only available from LAMPF (ie. ^{88}Y, ^{109}Cd, ^{22}Na). The higher beam current will improve production yields, specific activity, throughput and cost efficiency. To reliably achieve this level of operation, modifications to the Linac are needed. The present limitations of the various Linac subsystems have been reviewed, and it is concluded that the best way to increase the average current is to make small improvements in several of the operating parameters, rather than trying to make a large increase in a single parameter. All changes are within the original machine design parameters. To begin this effort, the authors have attempted to theoretically model the heat transfer properties of three typical BLIP targets.

16759 (INP–1660/AP) **The adaptation of IFJ implantation facilities for the IBAD (Ion Beam Assisted Deposition) in the dual beam technique.** Drwiega, M. (Institute of Nuclear Physics, Cracow (Poland)); Lipinska, E.; Rajchel, B.; Wierba, M. Institute of Nuclear Physics, Cracow (Poland). Jan 1994. 22p. (In Polish). Grant KBN 77326 92 03. Order Number DE95628927. Source: OSTI; NTIS; INIS.

The progress in reconstruction of ion implantation facilities in the Institute of Nuclear Physics: new facilities for IBAD method and Dual Beam System are presented. 32 refs, 4 figs, 1 tab.

16760 Apparatus for supporting a cryogenic fluid containment system within an enclosure. Ganni, V.; Stifle, K.E.; Zhang, B.X. To Dept. of Energy. 1993. Filed date 4 Mar 1993. U.S. Patent Application 8-027,063. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95009977. Source: OSTI; NTIS (US Sales Only); GPO Dep.

An apparatus for supporting at least one inner cryogenic fluid containment system within an outer isolating enclosure to retard heat transfer into the inner containment system comprising a plurality of supports serially interconnected and laterally spaced by lateral connections to extend the heat conduction path into the inner containment system.

16761 (UCRL-ID–118274) **EBIT: Electron Beam Ion Trap V-Division Experimental Physics annual report 1993.** Schneider, D. (ed.). Lawrence Livermore National Lab., CA (United States). Aug 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010207. Source: OSTI; NTIS; GPO Dep.

This report discusses research being conducted using the electron beam ion trap. The areas of this research are: atomic structure measurements; diagnostics for fusion and astrophysics; ion/surface interaction studies; electron-ion interaction studies; electron, positron and ion collisions; and instrumental developments.

16762 (UCRL-JC–117182) **Studies of highly charged ions with EBIT and Super-EBIT.** Elliott, S.R. Lawrence Livermore National Lab., CA (United States). 14 Sep 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940922–5: 7. international conference on physics of highly charged ions, Vienna (Austria), 19-23 Sep 1994). Order Number DE95010251. Source: OSTI; NTIS; INIS; GPO Dep.

The LLNL electron beam ion traps provide cold highly charged ions up to bare U. These machines have provided a wealth of atomic physics data using a compact, relatively inexpensive, device. The physics program has studied electron-ion collisions, QED, ion-surface interactions, and plasmas physics among many other topics. The prospects for the study of the highest charge states in the highest Z ions led to the beam energy upgrade of the first EBIT into Super-EBIT. The desire to use ions as a research probe in themselves led to an ion extraction program on EBIT-2. Finally, a Penning trap (referred to as the RETRAP) has been constructed to catch extracted ions where they can be further cooled and studied. Results of several experiments at the LLNL EBIT facility are described. The program's capabilities are discussed.

6613 Other Aspects of Physical Science

Refer also to citation(s) 16076, 16527, 16714, 16739

16763 (DOE/ER/40481–T1) **Low energy solar neutrino experiments: The Soviet American Gallium Experiment (SAGE). Final report, August 12, 1988–October 31, 1994.** Louisiana State Univ., Baton Rouge, LA (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER40481. Order Number DE95010159. Source: OSTI; NTIS; INIS; GPO Dep.

Two ^{71}Ga experiments are currently in operation. The first is the 60 ton Soviet American Gallium Experiment (SAGE) at Baksan, which has recently reported a signal level of $73+18/-16(\text{stat})+5/-7(\text{syst})$ SNU; the second is the 30 ton GALLEX experiment at Gran Sasso, which sees $87\pm14\pm7$ SNU. Both results are consistent, and both suggest a neutrino flux level low compared to the total expected from standard solar model calculations. It is not possible, however, to make a case for flux levels lower than the p-p prediction. Assuming the experiments are correct (Neutrino source calibrations are planned for both SAGE and GALLEX in the near future.), it is not at all clear yet whether the answer lies with the neutrino physics, solar physics, or a combination of both. Nevertheless, though solar model effects cannot be ruled out, if the Homestake and Kamiokande results are taken at face value, then these two experiments alone imply that neutrino oscillations or some similar particle physics result must be present to some degree. This report reviews the SAGE experiment and recent results. Non-radiochemical experiments are also discussed, with an emphasis on the Kamiokande water Cerenkov results.

16764 (DOE/ET/53088–698) **On the quasihydrostatic flows of radiatively cooling self-gravitating gas clouds.** Meerson, B. (Hebrew Univ. of Jerusalem (Israel). Racah Institute of Physics); Megged, E.; Tajima, T. Texas Univ., Austin, TX (United States). Mar 1995. 39p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG05-80ET53088. Grant ATM 9113576. (IFSR–698). Order Number DE95009116. Source: OSTI; NTIS; INIS; GPO Dep.

Two model problems are considered, illustrating the dynamics of quasihydrostatic flows of radiatively cooling, optically thin self-gravitating gas clouds. In the first problem, spherically symmetric flows in an unmagnetized plasma are considered. For a power-law dependence of the radiative loss function on the temperature, a one-parameter family of self-similar solutions is found. The authors concentrate on a constant-mass cloud, one of the cases, when the self-similarity indices are uniquely selected. In this case, the self-similar flow problem can be formally reduced to the classical Lane-Emden equation and therefore solved analytically. The cloud is shown to undergo radiative condensation, if the gas specific heat ratio $\gamma > 4/3$. The condensation proceeds either gradually, or in the form of (quasihydrostatic) collapse. For $\gamma < 4/3$, the cloud is shown to expand. The second problem addresses a magnetized plasma slab that undergoes quasihydrostatic radiative cooling and condensation. The problem is solved analytically, employing the Lagrangian mass coordinate.

16765 (IC–94/234, pp. 6) **On the stability of proteinoid microspheres.** Mueller Herold, U. (Eidgenoessiche Technische Hochschule, Zurich (Switzerland). Lab. fuer Physikalische Chemie); Nickel, G. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Proteinoid Microspheres are stable hollow spheres in the range of 5 fm diameter. Their stability is discussed in terms of macroscopic energies. It is shown that the bulk and surface energy contributions alone cannot lead to stable microspheres. If electrostatic energy, due to transmembrane voltage, is taken into account, stable hollow spheres are proved to exist. For several reasons, however, this should not be regarded as the ultimate explanation of microsphere stability. (author). Abstract only.

16766 (IC–94/234, pp. 8) **Some aspects about laboratory cometary models.** Negron Mendoza, A. (Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Inst. de Ciencias Nucleares); Albarran, G.; Ramos, S.; Chacon, E. International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

During the past decades, astronomers have directed their attention toward the study of the solar system bodies, like comets, and they have made many discoveries. These studies have provided profound insights into the formation and earliest story of the solar system. A complementary role in the study of comets has been played by laboratory research on cometary models. In this paper, we discuss some aspects of laboratory experiments proposed in the literature, specially those associated with the chemical reactions that may occur in the comets. These comments are made the light of chemical composition, energy source, relevant chemical reactions and compounds detected in several laboratory simulations of cometary material. (author). Abstract only.

16767 (IC–94/234, pp. 19-22) **The origins of cellular chirality.** International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

One of the most striking properties of life is the fact that of the twenty indispensable protein amino acids, all (except glycine) are left-handed, that is, they rotate polarized light counterclockwise. In contrast, biologic sugars are all right-handed. Synthetic amino acids and sugars of nonbiological origin contain equal numbers of handed molecules. One cannot make spiral molecules of DNA out of synthetic, achiral amino acids and sugars. This paper speculates on the origins of cellular chirality in a unique geochemical setting for the precursors of life- the bubble columns in the surface environment of the World's oceans. 7 refs.

16768 (IC–95/28) **Structural transition models for a class or irreversible aggregates.** Canessa, E. International Centre for Theoretical Physics, Trieste (Italy). Feb 1995. 16p. Order Number DE95628183. Source: OSTI; NTIS (US Sales Only); INIS.

A progress report on two recent theoretical approaches proposed to understand the physics of irreversible fractal aggregates showing up a structural transition from a rather dense to a more multibranched growth is presented. In the first approach the transition is understood by solving the Poisson equation on a squared lattice. The second approach is based on the discretization of the Biharmonic equation. Within these models the transition appears when the growth velocity at the fractal surface presents a minimum. The effects of the surrounding medium and geometrical constraints for the seed particles are considered. By using the optical diffraction method, the structural transition is further characterized by a decrease in the fractal dimension for this peculiar class of aggregates. (author). 17 refs, 4 figs.

16769 (IC–95/32) **Propagation of EM waves in nonlinear magnetic and dielectric medias. Integrals of motion.** Nyamsuren, O. (International Centre for Theoretical Physics, Trieste (Italy)); Ochirbat, G. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 9p. Order Number DE95628184. Source: OSTI; NTIS (US Sales Only); INIS.

Scattering of electromagnetic wave on a nonlinear dielectric and magnetic film is considered. In both cases, the first integrals of motion having TE and TM field components are presented. For each type of polarization we show that Maxwell's equations can be solved exactly in quadratures for optically isotropic media with magnetic permeability which can be an arbitrary function of the local magnetic field intensity. Kerr and saturable media are considered. (author). 12 refs.

16770 (JINR-E–5-94-362) **On Helmholtz Problem for Plane Periodical Structures.** Akishin, P.G.; Vinitskij, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. Order Number DE95627135. Source: OSTI; NTIS (US Sales Only); INIS.

The plane Helmholtz problem of the periodical disc structures with the phase shifts conditions of the solutions along the basis lattice vectors and the Dirichlet conditions on the basic boundaries is considered. The Green function satisfying the quasi periodical conditions on the lattice is constructed. The Helmholtz problem is reduced to the boundary integral equations for the simple layer potentials of this Green function. The methods of the discretization of the arising integral equations are proposed. The procedures of calculation of the matrix elements are discussed. The reality of the spectral parameter of the nonlinear continuous and discretized problems is shown. 8 refs., 2 figs.

16771 (JINR-E–11-90-204, pp. 70) **Computer algebra. Integrable systems and algebraic curves.** Kostov, N.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SCHROEDINGER EQUATION/potentials; POTENTIALS

16772 (JINR-E–11-90-204, pp. 78-79) **On computer algebra application in solving some statistical dynamical problems.** Malanin, V.V.; Poloskov, I.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FOKKER-PLANCK EQUATION/nonlinear problems; PROBABILITY; STOCHASTIC PROCESSES

16773 (LAMP–95/2) **Variation of the refractive index for the active layer of the double heterostructure GaAlAsSb/GaInAsSb/GaAlAsSb in injected mode.** LAMP series report (Laser, Atomic and Molecular Physics), LAMP series report (Laser, Atomic and Molecular Physics). Mohou, M.A. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 12p. Order Number DE95628929. Source: OSTI; NTIS (US Sales Only); INIS.

This work reports on the influence of the injected current on the refractive index in the active layer of GaInAsSb/GaAlAsSb laser diodes. These diodes present at threshold a full beam width at half power θ perpendicular of about 52 deg. C. The fluctuation of the refractive index caused by the injection of free carriers was studied on the basis of the evolution of θ perpendicular as a function of the injected current. It was shown that the inversion of the population which follows the rising of the gain, causes a slight decrease of the refractive index. 12 refs, 5 figs.

16774 (LA-UR–95-1082) **Low-density ionization behavior.** Baker, G.A. Jr. Los Alamos National Lab., NM (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9506170–1: Condensed matter theories, Caracas (Venezuela), 12-17 Jun 1995). Order Number DE95009495. Source: OSTI; NTIS; GPO Dep.

As part of a continuing study of the physics of matter under extreme conditions, I give some results on matter at extremely low density. In particular I compare a quantum mechanical calculation of the pressure for atomic hydrogen with the corresponding pressure given by Thomas-Fermi theory. (This calculation differs from the "confined atom" approximation in a physically significant way.) Since Thomas-Fermi theory in some sense, represents the case of infinite nuclear charge, these cases should represent extremes. Comparison is also made with Saha theory, which considers ionization from a chemical point of view, but is weak on excited-state effects. In this theory, the pressure undergoes rapid variation as electron ionization levels are passed. This effect is in contrast to the smooth behavior of the Thomas-Fermi fixed temperature, complete ionization occurs in the low density limit, I study the case where the temperature goes appropriately to zero with the density. Although considerable modification is required, Saha theory is closer to the actual results for this case than is Thomas-Fermi theory.

16775 (LA-UR–95-1097) **A collisionless shock wave experiment.** Winske, D.; Jones, M.E.; Sgro, A.G.; Thomas, V.A. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9504132–2: Spring workshop on basic science using pulsed power, Santa Barbara, CA (United States), 5-7 Apr 1995). Order Number DE95009489. Source: OSTI; NTIS; INIS; GPO Dep.

Collisionless shock waves are a very important heating mechanism for plasmas and are commonly found in space and astrophysical environments. Collisionless shocks were studied in the laboratory more than 20 years ago, and more recently in space via in situ satellite measurements. The authors propose a new laboratory shock wave experiment to address unresolved issues related to the differences in the partition of plasma heating between electrons and ions in space and laboratory plasmas, which can have important implications for a number of physical systems.

16776 (SAND–94-2324C) **Structural analyses of the JPL Mars Pathfinder impact.** Gwinn, K.W. (Sandia National Labs., Albuquerque, NM (United States). Material and Structural Mechanics Dept.). Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950582–1: 13. AIAA aerodynamic decelerator systems technology conference, Clearwater Beach, FL (United States), 15-19 May 1995). Order Number DE95009581. Source: OSTI; NTIS; GPO Dep.

The purpose of this paper is to demonstrate that finite element analysis can be used in the design process for high performance fabric structures. These structures exhibit extreme geometric nonlinearity; specifically, the contact and interaction of fabric surfaces with the large deformation which necessarily results from membrane structures introduces great complexity to analyses of this type. All of these features are demonstrated here in the analysis of the Jet Propulsion Laboratory (JPL) Mars Pathfinder impact onto Mars. This lander system uses airbags to envelope the lander experiment package, protecting it with large deformation upon contact. Results from the analysis show the stress in the fabric airbags, forces in the internal tendon support system, forces in the latches and hinges which allow the lander to deploy after impact, and deceleration of the lander components. All of these results provide the JPL engineers with design guidance for the success of this novel lander system.

16777 (UCRL-ID–118223) **Future scientific applications for high-energy lasers.** Lee, R.W. (comp.). Lawrence Livermore National Lab., CA (United States). 1 Aug 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009380. Source: OSTI; NTIS; GPO Dep.

This report discusses future applications for high-energy lasers in the areas of astrophysics and space physics; hydrodynamics; material properties; plasma physics; radiation sources; and radiative properties.

16778 (UCRL-JC–118357) **Status of the large-scale dark-matter axion search.** Van Bibber, K. (Lawrence Livermore National Lab., CA (United States)); Hagmann, C.; Stoeffl, W.; Daw, E.; Rosenberg, L.; Sikivie, P.; Sullivan, N.; Tanner, D.; Moltz, D.; Tighe, R. Lawrence Livermore National Lab., CA (United States). Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC03-76SF00098 ; AC02-76CH03000 ; FC02-94ER40818 ; FG05-86ER40272 ; FG02-90ER40560. (CONF-9402136–1: International conference on critique of the source of dark matter in the universe, Bel Air, CA (United States), 16-18 Feb 1994). Order Number DE95008828. Source: OSTI; NTIS; GPO Dep.

If axions constitute the dark matter of our galactic halo they can be detected by their conversion into monochromatic microwave photons in a high-Q microwave cavity permeated by a strong magnetic field. A large-scale experiment is under construction at LLNL to search for halo axions in the mass range 1.3 - 13 μeV, where axions may constitute closure density of the universe. The search builds upon two pilot efforts at BNL and the University of Florida in the late 1980's, and represents a large improvement in power sensitivity ($\sim$50) both due to the increase in magnetic volume (B^2V = 14 T^2m^3), and anticipated total noise temperature (T_n $\sim$3K). This search will also mark the first use of multiple power-combined cavities to extend the mass range accessible by this technique. Data will be analyzed in two parallel streams. In the first, the resolution of the power spectrum will be sufficient to resolve the expected width of the overall axion line, $\sim$◯ (1kHz). In the second, the resolution will be ◯(O.01-1 Hz) to look for extremely narrow substructure reflecting the primordial phase-space of the axions during infall. This experiment will be the first to have the required sensitivity to detect axions, for plausible axion models.

6620 Physics of Elementary Particles and Fields

Refer also to citation(s) 16854, 16855, 17356

16779 (BNL–61593) **Physics goals of a μ^+ μ^- collider.** Barger, V. (Univ. of Wisconsin, Madison, WI (United States). Physics Dept.); Berger, M.S.; Fujii, K. Brookhaven National Lab., Upton, NY (United States); Wisconsin Univ., Madison, WI (United States). Dept. of Physics; California Univ., Davis, CA (United States). Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States);Wisconsin Univ., Madison, WI (United States);California Univ., Berkeley, CA (United States). DOE Contract AC02-76CH00016 ; FG02-95ER40896 ; FG03-91ER40674. (CONF-9411210–2: 2. workshop on physics potential and development of mu+ mu- colliders, Sausalito, CA (United States), 17-19 Nov 1994). Order Number DE95009546. Source: OSTI; NTIS; INIS; GPO Dep.

This working group report focuses on the physics potential of $\mu^+\mu^-$ colliders beyond what can be accomplished at linear e^+e^- colliders and the LHC. Particularly interesting possibilities include (1) s-channel resonance production to discover and study heavy Higgs bosons with ZZ and WW couplings that are suppressed or absent at tree-level (such as the H and A Higgs bosons of

supersymmetric models), (2) study of the strongly interacting electroweak sector, where higher energies give larger signals, and (3) measurements of the masses and properties of heavy supersymmetric particles.

16780 (DOE/ER/40633–3) **Annual report for the High Energy Physics Program at Texas A and M University, October 1, 1993–September 30, 1994.** Texas A and M Univ., College Station, TX (United States). Dept. of Physics. Oct 1994. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91ER40633. Order Number DE95010155. Source: OSTI; NTIS; INIS; GPO Dep.

The experimental and theoretical high energy physics programs at Texas A and M University have continued their ambitious research activities over the past year. On the experimental side, the authors have continued their participation in two major operating experiments, CDF and MACRO, and each of these programs have attained significant milestones during this period. Especially note worthy is the CDF Collaborations paper on the "evidence" for the top quark and MACRO's completion of the construction of the "Attico". In CDF, the Texas A and M group continues to play a leading role in the plans for upgrading the silicon vertex detector, as well as supporting the on going running of this experiment during its current data taking run. In addition, the group has focused its analysis efforts on studies of trilepton events and as well searching for supersymmetric particles. In MACRO, the authors have continued their work on the development of the final version of the wave form digitizing system. Within the past month the final production circuits have been assembled and they are currently testing these units at Texas A and M. The authors plan to complete this testing and commission the wave form digitizing system on the MACRO detector by the end of 1994. The theoretical high energy physics program has also continued to develop during the past funding cycle. D. Nanopoulos and colleagues have continued the study of their very successful string-derived model that unifies all known interactions; flipped SU(5), which is the leading candidate for a theory of everything. C. Pope has continued his work on generalizations of the symmetries of string theory, known as W algebras.

16781 (SLAC–444) **Spin structure in high energy processes: Proceedings.** DePorcel, L.; Dunwoodie, C. (eds.). Stanford Linear Accelerator Center, Menlo Park, CA (United States). Dec 1994. 593p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930767–: 21. annual SLAC Summer Institute on particle physics: spin structure in high-energy processes, Stanford, CA (United States), 26 Jul - 6 aug 1993). Order Number DE95008628. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains papers as the following topics: Spin, Mass, and Symmetry; physics with polarized Z^0s; spin and precision electroweak physics; polarized electron sources; polarization phenomena in quantum chromodynamics; polarized lepton-nucleon scattering; polarized targets in high energy physics; spin dynamics in storage rings and linear accelerators; spin formalism and applications to new physics searches; precision electroweak physics at LEP; recent results on heavy flavor physics from LEP experiments using 1990–1992 data; precise measurement of the left-right cross section asymmetry in Z boson production by electron-positron collisions; preliminary results on heavy flavor physics at SLD; QCD tests with SLD and polarized beams; recent results from TRISTAN at KEK; recent B physics results from CLEO; searching for the H dibaryon at Brookhaven; recent results from the compton observatory; the spin structure of the deuteron; spin structure of the neutron (^{3}HE) and the Bjoerken sum rule; a consumer's guide to lattice QCD results; top ten models constrained by b → sγ; a review of the Fermilab fixed target program; results from the D0 experiment; results from CDF at FNAL; quantum-mechanical suppression of bremsstrahlung; report from the ZEUS collaboration at HERA; physics from the first year of H1 at HERA, and hard diffraction. These papers have been cataloged separately elsewhere.

6621 General Theory of Particles and Fields

Refer also to citation(s) 16740, 17168, 17356

16782 (BNL–61547) **Applications of chiral symmetry.** Pisarski, R.D. Brookhaven National Lab., Upton, NY (United States). Mar 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9404253–1: Workshop on finite temperature QCD and Quark-Gluon transport theory, Wuhan (China), 18-21 Apr 1994). Order Number DE95009552. Source: OSTI; NTIS; INIS; GPO Dep.

The author discusses several topics in the applications of chiral symmetry at nonzero temperature. First, where does the rho go? The answer: up. The restoration of chiral symmetry at a temperature T_χ implies that the ρ and a_1 vector mesons are degenerate in mass. In a gauged linear sigma model the ρ mass increases with temperature, $m_\rho(T_\chi) > m_\rho(0)$. The author conjectures that at T_χ the thermal ρ - a_1, peak is relatively high, at about ~1 GeV, with a width approximately that at zero temperature (up to standard kinematic factors). The ω meson also increases in mass, nearly degenerate with the ρ, but its width grows dramatically with temperature, increasing to at least ~100 MeV by T_χ. The author also stresses how utterly remarkable the principle of vector meson dominance is, when viewed from the modern perspective of the renormalization group. Secondly, he discusses the possible appearance of disoriented chiral condensates from "quenched" heavy ion collisions. It appears difficult to obtain large domains of disoriented chiral condensates in the standard two flavor model. This leads to the last topic, which is the phase diagram for QCD with three flavors, and its proximity to the chiral critical point. QCD may be very near this chiral critical point, and one might thereby generated large domains of disoriented chiral condensates.

16783 (GSI–95-12(prepr.)) **Comment on the diagonalisation of Green functions.** Henning, P.A. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Inst. fuer Theoretische Physik). Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Feb 1995. 8p. Order Number DE95770050. Source: OSTI; NTIS (US Sales Only); INIS.

Real-time thermal field theory is known in the two flavors "closed-time path formalism" and "thermo field dynamics". With a certain choice of parameters the full two-point functions of these models are identical, hence a scheme to diagonalize the Green function in one model can be applied to the other as well. This allows to compare the diagonalization schemes that have been discussed in the recent literature in order to select the simplest one. Such comparison speaks in favor of a diagonalization method which is motivated from thermo field dynamics. (orig.)

16784 (IC–94/60) **Influence of supersymmetric particle pair emission by electron on evolution of neutron star.** Likhachev, G.G. (Moscow State Univ., Moscow (Russian Federation). Dept. of Theoretical Physics); Studenikin, A.I. International Centre for Theoretical Physics, Trieste (Italy). Apr 1994. 12p. Order Number DE95628208. Source: OSTI; NTIS (US Sales Only); INIS.

The processes of emission of a pair of supersymmetric particles (wino and sneutrino or selection and photino) by electron in strong magnetic field of neutron star are discussed. The contributions to the energy losses of the neutron star due to these processes are calculated. The comparison of these new proposed mechanisms of energy losses with the standard neutrino mechanism is presented. (author). 25 refs.

16785 (IC–94/390) **Non-abelian bosonization and higher spin symmetries.** Zaikov, R.P. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 25p. Order Number DE95628187. Source: OSTI; NTIS (US Sales Only); INIS.

The higher spin properties of the non-abelian bosonization in the classical theory are investigated. Both the symmetry transformation algebra and the classical current algebra for the non-abelian free fermionic model are linear Gel'fand-Dickey type algebras. However, for the corresponding WZNW model these algebras are different. There exist symmetry transformations which algebra remains the linear Gel'fand-Dickey algebra while in the corresponding current algebra nonlinear terms arised. Moreover, this algebra is closed (in Casimir form) only in an extended current space in which nonlinear currents are included. In the affine sector, it is necessary to include higher isotopic spin current too. As result we have have a triple extended algebra. (author). 30 refs.

16786 (IC–94/392) **Method of solving conformal models in D-dimensional space I.** Fradkin, E.S. (International Centre for Theoretical Physics, Trieste (Italy)); Palchik, M.Ya. International Centre for Theoretical Physics, Trieste (Italy). Dec 1994. 64p. Order Number DE95628933. Source: OSTI; NTIS (US Sales Only); INIS.

We study the Hilbert space of conformal field theory in D-dimensional space. The latter is shown to have model-independent structure. The states of matter fields and gauge fields form orthogonal subspaces. The dynamical principle fixing the choice of model may be formulated either in each of these subspaces, or in their direct sum. In the latter case, gauge interactions are necessarily present in the model. We formulate the conditions specifying the class of models where gauge interactions are being neglected. The anomalous Ward identities are derived. Different values of anomalous parameters (D-dimensional analogues of a central charge, including operator ones) correspond to different models. The structure of these models is analogous to that of 2-dimensional conformal theories. Each model is specified by D-dimensional analog of null vector. The exact solutions of the simplest models of this type are examined. It is shown that these models are equivalent to Lagrangian models of scalar fields with a triple interaction. The values of dimensions of such fields are calculated, and the closed sets of differential equations for higher Green functions are derived. (author). 25 refs.

16787 (IC–95/24) **Topology change and quantum physics.** Balachandran, A.P. (Syracuse Univ., NY (United States). Dept. of Physics); Bimonte, G.; Marmo, G.; Simoni, A. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 17p. (DSF-T–5/95; SU–4240-604.). Order Number DE95628932. Source: OSTI; NTIS (US Sales Only); INIS.

The role of topology in elementary quantum physics is discussed in detail. It is argued that attributes of classical spatial topology emerge from properties of state vectors with suitably smooth time evolution. Equivalently, they emerge from considerations on the domain of the quantum Hamiltonian, this domain being often specified by boundary conditions in elementary quantum physics. Several examples are presented where classical topology is changed by smoothly altering the boundary conditions. When the parameters labelling the latter are treated as quantum variables, quantum states need not give a well-defined classical topology, instead they can give a quantum superposition of such topologies. An existing argument of Sorkin based on the spin-statistics connection and indicating the necessity of topology change in quantum gravity is recalled. It is suggested therefrom and our results here that Einstein gravity and its minor variants are effective theories of a deeper description with additional novel degrees of freedom. Other reasons for suspecting such a microstructure are also summarized. (author). 22 refs, 3 figs.

16788 (IC–95/41) **An exact cosmological solution to string theory.** Jofre, O. (Instituto de Astronomia y Fisica del Espacio, Buenos Aires (Argentina)); Nunez, C. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 15p. Order Number DE95628934. Source: OSTI; NTIS (US Sales Only); INIS.

A homogeneous anisotropic four dimensional spacetime with Lorentzian signature is constructed from an ungauged WZW model based on a non-semisimple Lie group. The associated non-linear σ-model describes string propagation in an expanding-contracting universe with antisymmetric tensor and dilation backgrounds. The current algebra of SL(2,R) x R is constructed in terms of two free boson fields and two generalized parafermions, or four free bosons with background charge. This representation is used to study the string spectrum in the cosmological background. (author). 24 refs.

16789 (IHEP–93-126) **New series of 3 D lattice integrable models.** Mangazeev, V.V.; Sergeev, S.M.; Stroganov, Yu.G. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 17p. Order Number DE95628935. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper we present a new series of 3-dimensional integrable lattice models with N colors. The weight functions of the models satisfy modified tetrahedron equations with N states and give a commuting family of two-layer transfer-matrices. The dependence on the spectral parameters corresponds to the static limit of the modified tetrahedron equations and weights are parameterized in terms of elliptic functions. The models contain two free parameters: elliptic modulus and additional parameter η. 12 refs.

16790 (INS–1087) **Quantum and classical aspects of deformed c = 1 strings.** Nakatsu, T.; Tsujimaru, S.; Takasaki, K. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jan 1995. 53p. Order Number DE95767950. Source: OSTI; NTIS; INIS.

The quantum and classical aspects of a deformed c=1 matrix model proposed by Jevicki and Yoneya are studied. String equations are formulated in the framework of the Toda lattice hierarchy. The Whittaker functions now play the role of generalized Airy functions in $c<1$ strings. This matrix model has two distinct parameters. Identification of the string coupling constant is thereby not unique, and leads to several different perturbative interpretations of this model as a string theory. Two such possible interpretations are examined. In both cases, the classical limit of the string equations, which turns out to give a formal solution of Polchinski's scattering equations, shows that the classical scattering amplitudes of massless tachyons are insensitive to deformations of the parameters in the matrix model. (author).

16791 (JINR-E–2-94-377) **From Antibracket to Equivariant Characteristic Classes.** Nersesyan, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 6p. Order Number DE95627183. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

We construct the odd symplectic structure and the equivariant even (pre)symplectic one from it on the space of differential forms on the Riemann manifold. The Poincare-Cartan like invariants of the second structure define the equivariant generalizations of Euler classes on the surfaces. 14 refs.

16792 (JINR-E–2-94-388) **The Background-Field Method and Noninvariant Renormalization.** Avdeev, L.V.; Kazakov, D.I.; Kalmykov, M.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 16p. Order Number DE95627147. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

We investigate the consistency of the background-field formalism when applying various regularizations and renormalization schemes. By an example of a two-dimensional σ model it is demonstrated that the background-field method gives incorrect results when the regularization (and/or renormalization) is noninvariant. In particular, it is found that the cut-off regularization and the differential renormalization belong to this class and are incompatible with the background-field method in theories with nonlinear symmetries. 17 refs.

16793 (JINR-E–2-94-410) **On q-Deformed Spinning Relativistic Particle.** Malik, R.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. Order Number DE95628188. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

A q-deformed free spinning relativistic particle is discussed in the framework of the Lagrangian formalism. Three equivalent Lagrangians are obtained for this system which are endowed with q-deformed local (super)gauge symmetries and reparametrization invariance. It is demonstrated that these symmetries are on-shell equivalent only for $q=\pm1$ under particular identification of the transformation parameters. The same condition ($q=\pm1$) emerges due to the requirement that the q-commutator of two supersymmetric gauge transformation. For a specific gauge choice, the solutions for equations of motion respect $GL_{\sqrt{q}}(1|1)$ and $GL_q(2)$ invariances for any arbitrary value of the evolution parameter characterizing the quantum super world-line. 15 refs.

16794 (JINR-E–2-94-443) **Some New Integrable Equations from the Self-Dual Yang-Mills Equations.** Ivanova, T.A.; Popov, A.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 16p. Order Number DE95628209. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. A.

Using the symmetry reductions of the self-dual Yang-Mills (SDYM) equations in (2+2) dimensions, we introduce new integrable equations which are 'deformations' of the chiral model in (2+1) dimensions, generalized nonlinear Schroedinger, Korteweg-de Vries, Toda lattice, Garnier, Euler-Arnold, generalized Calogero-Moser and Euler-Calogero-Moser equations. The Lax pairs for all of these equations are derived by the symmetry reductions of the Lax pair for the SDYM equations. 34 refs.

16795 (JINR-E-2-94-444) **Classical Dynamics of Rotating Relativistic String with Massive Ends: the Regge Trajectories and Quark Masses.** Barbashov, B.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 14p. Order Number DE95628189. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics. B.

Dynamic equations in the theory of a relativistic string with point masses at the ends are formulated in terms of geometric invariants of the world trajectories of the massive ends of the string (curvature k_i and torsion $\kappa_i(\tau)$, i=1,2 of the trajectories). With these characteristics we reproduce the string world surface up to its position in Minkowski space E_2^1. The torsions $\kappa_i(\tau)$, i=1,2 obey a system of second order differential equations with delay arguments describing the retardation effects of the interaction of masses through the string, k_i being constants. The constant torsions are investigated in detail. In this case the string world sheet is a helicoid in E_2^1. A nonlinear relation (the Regge trajectory) between the angular momentum of the system, J and the mass squared, M^2, is derived. For given meson masses (M) and spin (J), the masses of quarks are calculated. 14 refs., 1 fig., 1 tab.

16796 (JINR-E-2-94-449) **Solution of Self-Duality Equation in Quantum-Group Gauge Theory and Quantum Harmonics.** Zupnik, B.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 10p. Order Number DE95628210. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

We discuss the gauge theory for quantum group $SU_q(2)xU(1)$ on the quantum Euclidean space. This theory contains three physical gauge fields and one U(1)-gauge fields with a zero field strength. We construct the quantum-group self-duality equation (QGSDE) in terms of differential forms and with the help of field-strength decomposition. A deformed analog of the BPST-instanton solution is obtained. We consider a harmonic (Twistor) interpretation of QGSDE in terms of $SU_q(2)/U(1)$ quantum harmonics. The quantum harmonic gauge equations are formulated in the framework of a left- covariant 3D differential calculus on the quantum group $SU_q(2)$. 19 refs.

16797 (JINR-E-2-94-462) **On One-Loop Renormalization of Black-Hole Entropy.** Fursaev, D.V.; Solodukhin, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. Order Number DE95628190. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review. Letters.

One-loop divergences appearing in the entropy of a quantum black hole are proven to be completely eliminated by the standard renormalization of both the gravitational constant and other coefficients by the R^2-terms in the effective gravitational action. The essential point of the proof is that due to the higher order curvature terms the entropy differs from the Bekenstein-Hawking one in the Einstein gravity by the contributions depending on the internal and external geometry of the horizon surface. 15 refs.

16798 (JINR-E-11-90-204, pp. 10-11) **Analysis calculation of higher order corrections in quantum field theory: methods and results.** Chetyrkin, K.G.; Kataev, A.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUANTUM FIELD THEORY/corrections; ANALYTICAL SOLUTION; GROUP CONSTANTS; CORRECTIONS; RENORMALIZATION; SUM RULES

16799 (JINR-E-11-90-204, pp. 12-13) **Methods and algorithms of perturbative calculations in quantum field theory and their computer implementation. (I) Theory and phenomenological applications.** Larin, S.A.; Surguladze, L.R.; Tkachev, F.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PERTURBATION THEORY/algorithms; COMPUTERIZED SIMULATION; ALGORITHMS; PROPAGATOR

16800 (JINR-E-11-90-204, pp. 13) **Methods and algorithms of perturbative calculations in quantum field theory and their computer implementation. (II) Program packages.** Larin, S.A.; Surguladze, L.R.; Tkachev, F.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PERTURBATION THEORY/algorithms; COMPUTER PROGRAM DOCUMENTATION; FEYNMAN PATH INTEGRAL; ALGORITHMS; SPACE-TIME

16801 (JINR-E-11-90-204, pp. 20) **On the automatic construction of representations of non-commutative algebras.** Labonte, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GROUP THEORY/algorithms; COMMUTATION RELATIONS; ALGORITHMS; MATHEMATICAL MODELS

16802 (JINR-E-11-90-204, pp. 31) **Stensor, a system for tensor- and noncommutative algebra.** Hornfeldt, L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. KALUZA-KLEIN THEORY/tensors; ALGEBRA; TENSORS; SPINORS

16803 (JINR-E-11-90-204, pp. 59) **Computer algebra calculations of multiparametric families of exact solutions of Einstein-Maxwell field equations.** Alekseev, G.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SPACE-TIME/vacuum states; EINSTEIN-MAXWELL EQUATIONS; NUMERICAL SOLUTION; SPACE-TIME

16804 (JINR-E-11-90-204, pp. 62) **Automation of construction of boson realization.** Burdik, C. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIE GROUPS/bosons; BOSONS; R CODES

16805 (JINR-E-11-90-204, pp. 75) **On calculation of integervalued characteristics of representations of simple Lie algebras.** Zolotykh, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna

(Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIE GROUPS/irreducible representations; COMPUTER CODES

16806 (JINR-E–11-90-204, pp. 93) **Symmetries and first integrals of chiral Skyrme model.** Ptukha, A.R.; Sanyuk, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHIRAL SYMMETRY; SKYRME POTENTIAL; SOLITONS

16807 (JINR-E–11-90-204, pp. 94) **On a reduction algorithm for chiral Lagrangians.** Sanyuk, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHIRAL SYMMETRY/many-dimensional calculations; ALGORITHMS; FUNCTIONALS

16808 (JINR-R–2-94-463) **Correlation Depletion Principle in High Energy Physics.** Baldin, A.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 8p. (In Russian). Order Number DE95627140. Source: OSTI; NTIS (US Sales Only); INIS.

The report presented at the Bogolyubov International Symposium 'Fundamental Problems of Theoretical and Mathematical Physics', Dubna, 18-21 Aug 1994.

It is shown that the correlation depletion principle in the velocity space similar to the Bogolyubov correlation depletion principle in the ordinary space-time is widely applied to QCD of large distances, to the description of multiparticle processes, and in relativistic nuclear physics. 16 refs.

6622 Specific Theories and Interaction Models; Particle Systematics

Refer also to citation(s) 16821, 16823, 16828, 16873, 16912, 17357

16809 (BNL–61549) **Thermal rho's in the quark-gluon plasma.** Pisarski, R.D. Brookhaven National Lab., Upton, NY (United States). Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950127–2: 11. international conference on ultra-relativistic nucleus-nucleus collisions, Monterey, CA (United States), 9-13 Jan 1995). Order Number DE95009543. Source: OSTI; NTIS; INIS; GPO Dep.

I discuss different models which predict changes in the mass of the thermal ρ field. I emphasize that while the predictions are strongly model dependent, nevertheless substantial shifts in the thermal ρ mass are expected to occur at the point of phase transition. As long as the thermal ρ peak does not become too broad, this should provide a striking signature of the existence of a phase transition.

16810 (DOE/ER/40272–212) **Electroweak flavor-conserving gauge processes: Virtual effects.** Kennedy, D.C. Florida Univ., Gainesville, FL (United States). Nov 1994. 14p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Florida Univ., Gainesville, FL (United States). DOE Contract FG05-86ER40272. Grant PHY89-04035. (UFIFT-HEP–9416; CONF-940722–45: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95009922. Source: OSTI; NTIS; INIS; GPO Dep.

The electroweak Standard Model is summarized at the classical and quantum levels, including its gauge symmetry and symmetry-breaking aspects. The full implications of precise measurements of electroweak gauge forces are presented in terms of electroweak parameters and quantum corrections. The minimal Standard Model (SM) (including the top quark) satisfies the data well, up to one-loop accuracy. Possible non-Standard states subject to electroweak forces in quantum corrections is highly restricted by the present data. The status of exact and approximate symmetries of the electroweak Standard Model is summarized.

16811 (IC–94/226) **On the possibility on constructing covariant chromomagnetic field models.** Cabo, A. (International Centre for Theoretical Physics, Trieste (Italy)); Penaranda, S.; Martinez, R. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 13p. Order Number DE95628225. Source: OSTI; NTIS (US Sales Only); INIS.

Expressions for SO(4) invariant euclidean QCD generating functionals are introduced which should produce non-vanishing gluon condensates. Their investigation is started here by initially considering the loop expansion of the corresponding effective action searching for a description differing from the usual perturbation theory. At this level, we consider special free propagators showing a sort or off-diagonal long range order. The calculation of the polarization tensor leads to a gluon mass term which is proportional to the squared root of the also finite value for $<G^2>$. The summation of all the one-loop contributions to the energy having only mass insertions, indicates the spontaneous generation of the condensate from the perturbative grounds state in a way resembling the similar effect in the case of the chromomagnetic field models. This initial inspection suggests the need for a closer investigation which will be considered elsewhere. (author). 22 refs.

16812 (IC–95/29) **Axino mass in supergravity models.** Chun, E.J. (International Centre for Theoretical Physics, Trieste (Italy)); Lukas, A. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 11p. Contract SC1-CT91-0729. (TUM-HEP–215/95; HEP-PH–9503233). Order Number DE95628214. Source: OSTI; NTIS (US Sales Only); INIS.

We analyze the mass of the axino, the fermionic superpartner of the axion, in general supergravity models incorporating a Peccei Quinn symmetry and determine the cosmological constraints on this mass. In particular, we derive a simple criterion to identify models with an LSP axino which has a mass of $O(m^2_{3/2}/f_{PQ}) = O(keV)$ and can serve as a candidate for (warm) dark matter. We point out that such models have very special properties and in addition, the small axino mass has to be protected against radiative corrections by demanding small couplings in the Peccei Quinn sector. Generically, we find an axino mass of order $m_{3/2}$. Such masses are constrained by the requirement of an axino decay which occurs before the decoupling of the ordinary LSP. Especially, for a large Peccei Quinn scale $f_{PQ} > 10^{11}$ GeV this constraint might be difficult to fulfill. (author). 16 refs.

16813 (INP–1666/PH) **Gluons from logarithmic slopes of F_2 in the NLL approximation.** Golec-Biernat, K. (Institute of Nuclear Physics, Cracow (Poland)). Institute of Nuclear Physics, Cracow (Poland). Feb 1994. 9p. Grant KBN 20198 91 01. Order Number DE95628957. Source: OSTI; NTIS; INIS.

We make a critical, next-to-leading order, study of the accuracy of the "Prytz" relation, which is frequently used to extract the gluon distribution at small x from the logarithmic slopes of the structure function F_2. We find that the simple relation is not generally valid in the HERA regime, but show that it is a reasonable approximation for gluons which are sufficiency singular at small x. (author). 9 refs, 3 figs.

16814 (INP–1667/PH) **Quark matter inside neutron stars in an effective chiral model.** Kotlorz, A. (Institute of Nuclear Physics, Cracow (Poland)); Kutschera, M. Institute of Nuclear Physics, Cracow (Poland). Feb 1994. 20p. Grant KBN 20204 91 01; Grant KBN 20054 91 01. Order Number DE95628954. Source: OSTI; NTIS; INIS.

An effective chiral model which describes properties of a single baryon predicts that the quark matter relevant to neutron stars, close to the deconfinement density, is in a chirally broken phase.

We find the SU(2) model that pion-condensed up and down quark matter is preferred energetically at neutron star densities. It exhibits spin ordering and can posses a permanent magnetization. The equation of state of quark matter with chiral condensate is very well approximated by bag model equation of the state with suitably chosen parameters. We study quark cores inside neutron stars in this model using realistic nucleon equations of state. The biggest quark core corresponds to the second order phase transition to quark matter. Magnetic moment of the pion-condensed quark core is calculated. (author). 19 refs, 10 refs, 1 tab.

16815 (JINR-E–2-94-368) **An Effective Chiral Meson Lagrangian at $O(p^6)$ from the NJL Model.** Bel'kov, A.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Lanev, A.V.; Schaale, A.; Scherer, S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 14p. Order Number DE95627203. Source: OSTI; NTIS (US Sales Only); INIS.

Talk at the Workshop on Chiral Perturbation Theory, Bratislava, Sep 5-10, 1994.

In this work we present a strong chiral meson Lagrangian up to and including $O(p^6)$ in the momentum expansion. It is derived from the Nambu-Jona-Lasinio (NJL) model using the heat-kernel method. Identities related to the properties of covariant derivatives of the chiral matrix U as well as field transformations have been used to predict the chiral coefficients of a minimal set of linearly independent terms. 16 refs.

16816 (JINR-E–2-94-371) **On the Reduction of Vector and Axial-Vector Fields in a Meson Effective Action at $O(p^4)$.** Bel'kov, A.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Lanev, A.V.; Schaale, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 16p. Order Number DE95627204. Source: OSTI; NTIS (US Sales Only); INIS.

Talk at the Workshop on Chiral Perturbation Theory, Bratislava, Sep 5-10, 1994.

Starting from an effective NJL-type quark interaction we have derived an effective meson action for the pseudoscalar sector. The vector and axial-vector degrees of freedom have been integrated out, applying the static equations of motion. As the results we have found a (reduced) pseudoscalar meson Lagrangian of the Gasser-Leutwyler type with modified structure coefficients L_i. This method has been also used to construct the reduced weak and electromagnetic-weak currents. The application of the reduced Lagrangian and currents has been considered in physical processes. 36 refs., 1 fig., 1 tab.

16817 (JINR-E–2-94-400) **Renormalization Group Improved Radiative Corrections to the Supersymmetric Higgs Boson Masses.** Gladyshev, A.V. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Fizicheskij Fakul'tet); Kazakov, D.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 10p. Order Number DE95627187. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. Section B.

The one-loop radiative corrections to the Higgs boson potential in the MSSM, originating from the top quark loops, are summed in the leading log approximation using the renormalization group. The RG improved effective potential is minimized and the corrections to the CP-odd and CP-even Higgs boson masses are calculated. The resulting masses exhibit smoother top mass dependence than those calculated without RG summation. We have also found that for preferable values of the top mass the light Higgs mass does not exceed 100 GeV. 10 refs., 1 fig.

16818 (JINR-E–2-94-413) **Gluon Contribution to the Transverse Spin Structure Function g_2.** Belitskij, A.V.; Efremov, A.V.; Teryaev, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 10p. Order Number DE95628226. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

We consider the twist-3 gluon contribution to the transverse spin structure function g_2. We find that the Burkhardt-Cottingham sum rule is satisfied. The additional nonlocal operators appear in the moments of g_2 which absent in previous analysis of Bukhvostov, Kuraev and Lipatov. 10 refs.

16819 (JINR-R–2-94-483) **Axial Anomaly at the Arbitrary External Momenta.** Veretin, O.L.; Teryaev, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. (In Russian). Order Number DE95628227. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

In one loop approximation the analytical expression of the axial-vector triangle graph containing anomaly was obtained in a most general case of arbitrary virtualities of external momenta. The t'Hooft consistency principle is applied to the QCD sum rules for the first moment of the photon spin structure function. It is shown that the contribution of the singlet axial current to the sum rules g_1 appears to be zero. 19 refs., 1 fig.

16820 (JINR-R–4-94-406) **The Mass Spectrum and Decay Constants of Leptonic Decays of Pseudoscalar Mesons and Their Radial Excitation Within QCD-Motivated Potential Model with Harmonic Oscillator.** Amirkhanov, I.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Pervushin, V.N.; Sarikov, N.A.; Nasyrov, T.Z. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 20p. (In Russian). Order Number DE95627199. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

Within QCD-motivated potential model, the masses and decay constants of pseudoscalar mesons are calculated. The model is based on the effective QCD Hamiltonian in Coulomb's gauge, which forbids color states. The description of mesons in this model is realized with the use of Schwinger-Dyson and Bethe-Salpeter equations with certain phenomenological choice of the potential and renormalization method. Solutions of these equations are obtained in the hadronic oscillators potential approximation with the use of different methods of Schwinger-Dyson equation renormalization. It is shown, that the use of special modification of this renormalization, satisfying physical boundary conditions, allows us to describe the mass spectrum and decay constant of mesons and their radial excited states. (author). 9 refs., 15 figs., 3 tabs.

6623 Specific Interactions, Decays and Processes

Refer also to citation(s) 16373, 16400, 16813, 16847

16821 (DESY–95-002) **Higgs and background production in the reaction $e^+e^- \rightarrow b$ anti b + 2 jets at LEPII and NLC energies.** Boos, E. (Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik); Sachwitz, M.; Schreiber, H.J. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Jan 1995. 21p. Order Number DE95770021. Source: OSTI; NTIS (US Sales Only); INIS.

A complete tree-level Standard Model calculation of the reaction $e^+e^- \rightarrow$ b anti b + 2 jets in the energy range of LEPII and the Next e^+e^- Linear Collider is presented. The 2-jet system represents either a q anti q pair or two gluons. The matrix elements were calculated by means of the package CompHEP, and phase space integration and event generation were carried out with the computer programs BASES/SPRING. Cross sections of the Higgs boson, the total background and important subsets of background are studied as functions of the c.m.s. energy and the Higgs mass, taking into account possible interferences. Various event distributions calculated for realistic integrated luminosities indicate encouraging prospects regarding the extraction of the Higgs signal. (orig.)

16822 (DESY–95-003) **The energy behaviour of real and virtual photon-proton cross sections.** Levy, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jan 1995. 13p. Order Number DE95770020. Source: OSTI; NTIS (US Sales Only); INIS.

The recent F_2 measurements at HERA are discussed in the framework of virtual photon-proton cross section. The energy behaviour of the cross section is studied for different Q^2 values, ranging from 0 to 1000 GeV^2 for center of mass energies $1.75 < W < 300$ GeV. (orig.)

16823 (DESY–95-023) **An introduction to the perturbative QCD pomeron and to jet physics at large rapidities.** Del Duca,

V. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1995. 86p. (DFTT–13/95; HEP-PH–9503226). Order Number DE95770007. Source: OSTI; NTIS (US Sales Only); INIS.

In these lectures we discuss the Balitsky, Fadin, Kuraev, and Lipatov (BFKL) theory, which resumes the leading logarithmic contributions to the radiative corrections to parton scattering in the high-energy limit, and we apply it to hadronic two-jet production at large rapidity intervals. (orig.)

16824 (DOE/ER/40842–T1) **Charm decays and high energy photoproduction.** Puerto Rico Univ., Mayaguez (Puerto Rico). Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-94ER40842. Order Number DE95010165. Source: OSTI; NTIS; INIS; GPO Dep.

The activities during the first nine months of the three-year grant period have concentrated on the development of computer resources both hardware and software as well as the design of a muon detector for Fermilab Experiment E831. An important related activity has been a successful search of funds to complement the resources provided by this grant and permit the involvement of additional personnel as well as a much-better leveraged impact of the funds provided. Grant funds were the main providers of a new computer system which is dedicated to the High Energy Physics group at Mayaguez. This system can be considered a minimum configuration to carry out the simulation and analysis loads of E831. The bulk of the software development has been directed at developing a Monte Carlo simulation for E831 in particular the E831 muon detector.

16825 (FNAL/C–94/383) **Production asymmetries in x_f and P_t^2 for $D^{\pm}$ mesons.** Carter, T. E791 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Nov 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940616–91: Electronic materials conference, Boulder, CO (United States), 22-24 Jun 1994). Order Number DE95007207. Source: OSTI; NTIS; INIS; GPO Dep.

We present differences in leading and non-leading charged D meson production as a doubly-differential function of both P^2_t and $x\int$. Comparisons to specific models are made. This information is from the analysis of half the data from Fermilab experiment E791, taken during the 1991-2 fixed target run with a 500 GeV/c π^- beam incident on a segmented target.

16826 (FNAL/C–95/041) **Charm photoproduction dynamics.** Garbincius, P.H. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-950285–1: LAFEX international school in high energy physics, Rio de Janeiro (Brazil), 20 Feb 1995). Order Number DE95009106. Source: OSTI; NTIS; INIS; GPO Dep.

Photoproduction of open charm is reviewed, both as a tool for studying the properties of charm particles such as spectroscopy, decays, and lifetimes, and as a testing ground for theoretical calculations of production dynamics. Many characteristics of charm photoproduction are described in terms of the leading order (LO) $\alpha_{EM}\alpha_S$ Photon-Gluon Fusion (PGF) model. The next-to-leading order (NLO) corrections of strength $\alpha_{EM}\alpha_S^2$ due to radiation of additional gluons are then added. The sensitivities of the NLO calculations on the mass of the charm quark, m_c, and on the choice of the gluon structure function of the nucleon are illustrated for the energy dependence of the cross section for charm photoproduction. These are compared with fixed target data and new HERA data. The single charm particle inclusive distributions in x_f and $p_\perp^2$, along with $\sigma(\gamma N \rightarrow c\bar{c}X)$ give good estimates of m_c and n_g, the shape parameter for the gluon distribution within the nucleon. As in hadroproduction, some disagreements between prediction and observation begin to appear in trying to simultaneously match the distributions in both $p_\perp^2$ for single charm particles and in the $\Delta\Phi$ acoplanarity angle between pairs of charm particles. These can be partially remedied by modifying the fragmentation function for c-quarks into charm particles, and by including extra $k_\perp^2$ transverse smearing of the gluon distributions within the target nucleon. Initial studies of the relative production between charm particles and anti-particles indicate disagreement with the predictions of the independent string fragmentation model.

16827 (GSI–95-14(prepr.)) **Empirical regularities in the χ-dependence of nuclear J/Ψsuppression.** Gerschel, C. (Institut de Physique Nucleaire, Orsay (France)); Huefner, J.; Quack, E. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Feb 1995. 11p. Order Number DE95770049. Source: OSTI; NTIS (US Sales Only); INIS.

The measured ratios $R(x, A_1/A_2)$ for J/Ψ, Ψ' and $\mu^+\mu^-$ production on two different targets A_1, A_2 as a function of the fractional momentum x of the final state are well fit with a very simple functional form having three adjustable parameters. An empirical relation is found between the three parameters of the fit. The deduced J/Ψ absorption cross sections σ_{abs} cluster around two values of which only σ_{abs}=5.8±0.2 mb seems acceptable. (orig.)

16828 (IC–95/25) **(B+L)-conserving nucleon decays in supersymmetric models.** Vissani, F. International Centre for Theoretical Physics, Trieste (Italy). Feb 1995. 5p. Order Number DE95628258. Source: OSTI; NTIS (US Sales Only); INIS.

The presence of the (B + L)-conserving decay modes $n \rightarrow K^+e^-$, $n \rightarrow K^+\mu^-$, $p \rightarrow K^+e^-\pi^+$ and $p \rightarrow K^+\mu^-\pi^+$ is shown to be a characteristic feature of a class of models with explicit breaking of R-parity. These modes dominate over the (B - L)-conserving ones in certain regions of the parameter space; the impact of this scenarios for nucleon decay search at the Super-Kamiokande is discussed. (author). 10 refs.

16829 (IHEP–93-111) **Single top quark production and V_{tb} CKM matrix element measurement in high energy e^+e^- collisions.** Dokholyan, N.V. (Moskovskij Fiziko-Tekhnicheskij Inst., Moscow (Russian Federation)); Jikia, G.V. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 9p. Order Number DE95628962. Source: OSTI; NTIS (US Sales Only); INIS.

The new method of determination of CKM mixing matrix element V_{tb} has been proposed. It has been shown, that at the future colliders one will measure the tb-mixing element with the accuracy 12 - 28%. 16 refs., 6 figs., 1 tab.

16830 (INIS-mf–14483, pp. 151) **Nuclear interactions of ^{28}Si ions in emulsion at 14.6 AGeV.** Vrlakova, J. (Univerzita P.J. Safarika, Kosice (Slovakia). Prirodovedecka Fakulta). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Slovak). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR EMULSIONS/silicon 28 reactions; NUCLEAR FRAGMENTATION/silicon 28 reactions; GEV RANGE 100-1000; MULTIPLE PRODUCTION

16831 (INIS-mf–14483, pp. 152) **Fragmentation of ^{197}Au nuclei in emulsion at 10.7 GeV/nucleon.** Vrlakova, J. (Univerzita P.J. Safarika, Kosice (Slovakia). Prirodovedecka Fakulta). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Slovak). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR EMULSIONS/gold 197 reactions; NUCLEAR FRAGMENTATION/gold 197 reactions; GEV RANGE 100-1000

16832 (INP–1604/PH) **B-hadrons at LEP.** Zalewska, A. (Institute of Nuclear Physics, Cracow (Poland)). Institute of Nuclear Physics, Cracow (Poland). High Energy Physics Lab. 1992. 12p. Grant KBN 20963 91 01. (CONF-9205228–: 15. international Warsaw meeting on elementary particle physics, Kazimierz (Poland), 25-29 May 1992). Order Number DE95628968. Source: OSTI; NTIS; INIS.

The LEP results concerning the spectroscopy and decays of hadrons containing b-quarks are reviewed. Analyses of the data taken in 1990 and 1991 are covered. (author). 25 refs, 9 figs, 1 tab.

16833 (INP–1646/PH) **Multiple photon emission in heavy particle decays.** Asakimori, K. (Kobe Women's Junior College, Kobe (Japan)); Burnett, T.H.; Cherry, M.L. JACEE. Institute of Nuclear Physics, Cracow (Poland). Mar 1994. 19p. Grant KBN 20341 91 01. Order Number DE95628961. Source: OSTI; NTIS; INIS.

Cosmic ray interactions, at energies above 1 TeV/nucleon, in emulsion chambers flown on high altitude balloons have yielded two events showing apparent decays of a heavy particle into one charged particle and four photons. The photons converted into electron pairs very close to the decay vertex. Attempts to explain this decay topology with known particle decays are presented. Unless both events represent a b → u transition, which is statistically unlikely, then other known decay modes for charmed or bottom particles do not account satisfactorily for these observations. This could indicate, possibly, a new decay channel. (author). 7 refs, 6 figs, 2 tabs.

16834 (INP–1675/PH) **Low energy parameters of the K K-bar and $\pi\pi$ scalar-isoscalar interactions.** Kaminski, R. (Institute of Nuclear Physics, Cracow (Poland)); Lesniak, L. Institute of Nuclear Physics, Cracow (Poland). Jun 1994. 11p. Grant KBN 20198 91 01; M.Sklodowska-Curie Fund 2 PAA/NSF-94-158. Order Number DE95628966. Source: OSTI; NTIS; INIS.

Threshold expansions of the $\pi\pi$ and K K-bar spin 0 and isospin 0 scattering amplitudes are performed. Scattering lengths, effective ranges and so-called volume parameters are evaluated. Good agreement with the existing experimental data for the $\pi\pi$ scalar-isoscalar amplitude is found. An importance of future accurate measurements of the K K-bar threshold parameters is stressed. New data are needed to understand the basic features of the scalar mesons. (author). 31 refs, 3 tabs.

16835 (JINR-E–2-94-360) **Radiative and Hadronic Decays of Heavy Vector Mesons.** Ivanov, M.A.; Valit, Yu.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 19p. Order Number DE95627223. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pis'ma v Zhurnal Ehksperimental'noj i Teoreticheskoj Fiziki.

Within the relativistic quark model with confined light quarks we calculate the widths of radiative and hadronic decays of vector heavy mesons. They depend on the constituent masses of heavy quarks (M_c and M_b) which are the only adjustable parameters in our approach. Using the available experimental data from CLEO- and ARGUS-collaboration for the $D^* \to D\gamma$ and $D^* \to D\pi$ branching ratios, we find the allowed interval for the charm quark mass: 1,28 GeV < M_c < 1.66 GeV and give the predictions for the absolute values of decay widths. Also we consider the heavy quark limit $M_Q \to \infty$ with $E = M_H - M_Q$ being fixed for the decay amplitudes. 17 refs., 11 figs., 4 tabs.

16836 (JINR-E–2-94-391) **Pionium in the Elementary Particle Decays.** Silagadze, Z.K. (AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 11p. Order Number DE95627224. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pis'ma v Zhurnal Ehksperimental'noj i Teoreticheskoj Fiziki.

Some atomic decays of elementary particles with pionium ($\pi^+\pi^-$-dimesoatom) in the final state are considered. Only for K-meson atomic decays are the corresponding branching ratios big enough to make their experimental study realistic. The $O(\alpha)$ order corrections to the lifetime of pionium are also calculated. 17 refs.

16837 (JINR-E–6-94-382) **Measurement of the Induced Pseudoscalar Form Factor in the Capture of Polarized Muons by Si Nuclei.** Brudanin, V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Egorov, V.; Filippova, T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 19p. Order Number DE95627206. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics. A.

The observation with high resolution Ge-detectors of the 1229 keV and 2171 keV gamma-rays emitted in the ^{28} Si(μ, ν)^{28} Al(1$^+$, 2202 keV) reaction allowed us to determine the nuclear-amplitude ratio x≡ M(2)/M(-1) characteristic of this muon-capture reaction. Using the nuclear-structure dependent evaluation of various correction terms (model of s.Ciechanowicz), our result x = +0.254 ± 0.034 provides for the induced pseudoscalar coupling g_P the ratio $g_P/g_A(0{,}848\ m_\mu{}^2) = 3.4 \pm 1.0$, to be compared to the PCAC-prediction of $g_P/g_A = 7$. The model-dependence of this apparent quenching remains to be open. 59 refs., 5 figs., 5 tabs.

16838 (JINR-E–11-90-204, pp. 25) **Computer-interactive system for calculation of particle collision characteristics at high energies.** Boos, E. (and others); Dibinin, M.; Boneral, V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARTICLE INTERACTIONS/computerized simulation; MATRIX ELEMENTS

16839 (JINR-E–11-90-204, pp. 79) **Some computer realizations of the REDUCE-3 calculations for exclusive processes.** Darbaidze, Ya.Z.; Merebashvili, Z.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EXCLUSIVE INTERACTIONS/r codes; PERTURBATION THEORY; RADIATIVE CORRECTIONS

16840 (JINR-R–2-94-464) **Multi-Channel Analysis of Low Energy Nucleon-Antinucleon Interactions with the Help of Modified M-Matrix Method.** Ducheva, M.P.; Meshcheryakov, V.A.; Henner, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 16p. (In Russian). Order Number DE95628238. Source: OSTI; NTIS (US Sales Only); INIS.

The processes of elastic p anti p-scattering, charge-exchange p anti p → n anti n reaction and p anti p-annihilation have been investigated on the base of multichannel M-matrix method. The original method was modified by including the dynamic singularities due to t-channel meson exchange and by using the conform transformations to expand the applicability of the effective range expansion of the M-matrix approach. The developed model satisfactorily describes the experimental data. The important role of the p-wave is a result of the bound state near the threshold. 30 refs., 6 figs., 3 tabs.

16841 (SINS–2154/6) **LEP and results obtained by DELPHI after four years of operation.** Blocki, J. (Warsaw Univ. (Poland). Inst. Fizyki Doswiadczalnej); Brueckman de Renstrom, P.; Budziak, A. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). Oct 1993. 45p. (In Polish). Grant KBN 20963 91 01; Grant KBN 20252 91 01. Order Number DE95628963. Source: OSTI; NTIS; INIS.

We characterize the most important problems of modern elementary particles physics, for the solution of which the LEP (Large Electron Positron) accelerator was built. We present the characteristics of this accelerator. The structure and properties of the DELPHI detector are described with special emphasis on the contribution of Polish groups. The most important results obtained so far in the LEP accelerator are discussed. (author). 12 refs, 17 figs, 1 tab.

16842 (SLAC-R–95-458) **Studies of the strong and electroweak interactions at the Z_0 pole.** Hildreth, M.D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Mar 1995. 186p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC03-76SF00515. Order Number DE95010353. Source: OSTI; NTIS; INIS; GPO Dep.

This thesis presents studies of the strong and electroweak forces, two of the fundamental interactions that govern the behavior of matter at high energies. The authors have used the hadronic decays of Z^0 bosons produced with the unique experimental apparatus of the e^+e^- Linear Collider at the Stanford Linear Accelerator Center (SLAC) and the SLAC Large Detector (SLD) for these measurements. Employing the precision tracking capabilities of the SLD, they isolated samples of Z^0 events containing primarily the decays of the Z^0 to a chosen quark type. With an inclusive selection technique, they have tested the flavor independence of the strong coupling, α_s by measuring the rates of multi-jet production in isolated samples of light (uds), c, and b quark events. They find: ${\alpha_s}^{uds}/{\alpha_s}^{all}$ 0.987 ± 0.027(stat) ± 0.022(syst) ± 0.022(theory), ${\alpha_s}^c/{\alpha_s}^{all}$ = 1.012 ± 0.104(stat) ± 0.102(syst) ± 0.096(theory), ${\alpha_s}^b/{\alpha_s}^{all}$ = 1.026 ± 0.041(stat) ± 0.030(theory), which implies that the strong interaction is independent of quark flavor within the present experimental sensitivity. They have also measured the extent of parity-violation in the Z^0 $c\bar{c}$ coupling, given by the parameter ${A_c}^0$, using a sample of fully and partially reconstructed D^* and D^+ meson decays and the longitudinal polarization of the SLC electron beam. This sample of charm quark events was derived with selection techniques based on their kinematic properties and decay topologies. They find ${A_c}^0$ = 0.73 ± 0.22(stat) ± 0.10(syst). This value is consistent with that expected in the electroweak standard model of particle interactions.

16843 (SLAC-R–95-459) **A search for jet handedness in hadronic Z^0 decays.** Hasegawa, Yoji. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Mar 1995. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (TOHOKU-HEP–95-02; TOHOKU-HEP-NOTE–95-0). Order Number DE95010099. Source: OSTI; NTIS; INIS; GPO Dep.

Transport of polarization through hadronization process is one of the fundamental interest in Quantum Chromodynamics which is a theory of strong interactions. In the low energy region where the hadronization occurs, QCD calculations are difficult, therefore at present the transport can be investigated experimentally. In this study the authors have searched for signatures of polarization of quarks and antiquarks in hadronic jets from $Z^0 \rightarrow q\bar{q}$ decays. The polarization of quarks and antiquark produced by Z^0 decays are predicted by the Standard Model of elementary particle physics. The authors defined several quantities depending on "jet handedness" methods and studied the correlation between the predicted polarization and the quantities. The signal was estimated by analyzing power which represents degree of the polarization transport through the hadronization process. The Z^0 decays were measured by SLC Large Detector and the polarized electron beam provided by SLAC Linear Collider was useful for this study. The data from the 1993 run showed no signature of the transport of quark and antiquark polarization. Upper limits on magnitude of the analyzing power were set in the range 0.05-0.15 depending on the methods.

6624 Properties of Specific Particles and Resonances

Refer also to citation(s) 16825, 16832, 16843, 16914

16844 (IFVE-OEF–93-138) **Investigation of diffraction processes p + N → (ppp-bar) + N and p + N → (ppp-bar π^0) + N at proton energy E_p = 70 GeV.** Vavilov, D.V. (Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation)); Viktorov, V.A.; Golovkin, S.V. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 8p. (In Russian). Order Number DE95628970. Source: OSTI; NTIS (US Sales Only); INIS.

The results of investigation of diffraction processes p + N → (ppp-bar) + N and p + N → (ppp-bar π^0) + N are presented. No statistically significant resonant structure was observed in mass spectra. Upper limits of cross sections of narrow resonant states production in the reaction p + N → (ppp-bar) + N are given. 15 refs., 5 figs.

16845 (IHEP–93-98) **Investigation of $\rho^0(770)$ meson spin alignment in p-bar p interactions at 32 GeV/c.** Minaenko, A.A. (Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation)); Babintsev, V.V.; Bogolyubsky, M.Y. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 22p. Order Number DE95628971. Source: OSTI; NTIS (US Sales Only); INIS.

The spin alignment of a $\rho^0(770)$ meson has been investigated in p-bar p interactions at 32 GeV/c. The statistics of 250 K p-bar p collisions was obtained with the help of the liquid hydrogen bubble chamber 'Mirabelle'. Various reference frames have been used in the analysis and the most profound effect has been revealed in the transversity frame. The measured value of the spin density matrix element ρ_{00} amounts to 0.447 ± 0.033. 25 refs., 6 figs., 3 tabs.

16846 (INIS-mf–14483, pp. P31-P40) **Search for massive neutrinos in beta decay.** Dragoun, O. (Ceska Akademie ved, Prague (Czech Republic). Ustav Jaderne Fyziky). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists*. Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

An overview is presented of methods for determination of the electron antineutrino mass by the direct approach, i.e., by kinematic testing of the shape of the beta spectrum. Problems and prospects of nuclear electron spectroscopy in searching for mass neutrinos are discussed. (Z.S.). 5 figs., 22 refs.

16847 (INIS-mf–14530, pp. 7) **Electromagnetic properties of quasiparticles in a relativistic many-body theory.** Baier, H. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Bentz, W.; Arima, A. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUASI PARTICLES/electromagnetic fields; ELECTROMAGNETIC INTERACTIONS; FLUCTUATIONS; MANY-BODY PROBLEM; MESON-NUCLEON INTERACTIONS; NUCLEAR MATTER

16848 (INIS-mf–14530, pp. 14-16) **Investigation of the spallation products from the interaction of 800 MeV protons with aluminium.** Vonach, H. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Noll, M.; Drosg, M. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SPALLATION FRAGMENTS/aluminium; SPALLATION FRAGMENTS/interactions; SPALLATION FRAGMENTS/protons; COBALT 56; CROSS SECTIONS; EVEN-EVEN NUCLEI; FLUORINE 22; GAMMA SPECTRA; HIGH-PURITY GE DETECTORS; MASS SPECTROSCOPY; NEON; NUCLEAR MODELS; NUCLEI; PROMPT GAMMA RADIATION; ALUMINIUM; INTERACTIONS; PROTONS

16849 (INS-J–178) **Measurement of the proton structure function F_2 at HERA.** Nakao, Mikihiko (Tokyo Univ. (Japan)). Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Dec 1994. 139p. Order Number DE95768194. Source: OSTI; NTIS; INIS.

New results of the proton structure function F_2 are obtained from 543 nb^{-1} of data collected with ZEUS at HERA. The measurement extends over a wide kinematic region from 8.5 GeV^2 to 6280 GeV^2 in Q^2 and from 2.3×10^{-4} to 0.24 in x. The results consistently improves the previous F_2 results by ZEUS and H1, with the smaller errors, the finer binning and the extension of the kinematic range. In the small x region, F_2 increases steeply along with the decrease of x. However, F_2 shows slightly faster Q^2-evolution than available predictions at small x. The increase of F_2 at small x is compatible with the gluon distribution parametrized as $xg(x)\text{-}x^{-\lambda}$ with a value of λ between 0.3 and 0.5. (author) 61 refs.

16850 (JINR-E–1-94-387) **Highly Excited Matter Probed with Strangeness in Nucleus-Nucleus Collisions at JINR.** Okonov, Eh.O. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 4p. Order Number DE95627233. Source: OSTI; NTIS (US Sales Only); INIS.

The talk given at the International Conference 'Nucleus-Nucleus Collisions 5', Taormina, Italy, 30 May-4 Jun 1994.

Studies of characteristics of Λ and K^0 particles, produced in central collisions of nuclei from the synchrophasotron (E = 3.3 -3.7 A GeV) have revealed effects predicted as signals of the hadronic matter thermalization, compression and heating up to Boltzmann temperatures $T_B \simeq 160$ MeV ($T_0 \simeq 210$ MeV) with approaching the plateau which is then seen throughout more recent AGS/SPS results, up to E=200 A GeV. An increase of the relative Λ yield in mid rapidities has been observed as well which is also an evidence for a formation of the strangeness abundant mixed phase. The obtained data demonstrate that the strangeness is an efficient probe of the highly excited/compressed matter, i.e. in the baryon-rich regime, which requires (according to many model predictions) for the phase transition into Quark Gluon Plasma, rather low energies (2-5 A GeV) and would provide favourable signal/background ratios. This advantage is expected to be more pronounced in Nuclotron experiments at 5-6 A GeV which aim to examine the observed effects with heavier nuclei and to study other QGP signals including near-threshold production of anti Λ, Ξ, Ω, ϕ, H particles. The planned experiments could simulate more adequately some astrophysical processes and provide information not only about the deconfinement but about another phenomenon which also is predicted to provoke a QGP formation, namely the chiral symmetry restoration with its expected high density/low temperature effects. 12 refs., 1 fig., 1 tab.

16851 (JINR-E–2-94-404) **Longitudinal Structure Function F_L as Function of F_2 and $dF_2/d\ln Q^2$ at Small x.** Kotikov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 7p. Order Number DE95627231. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Pis'ma v Zhurnal Ehksperimental'noj i Teoreticheskoj Fiziki.

A formula is presented to extract the longitudinal deep inelastic structure function F_L from transverse structure function F^2 and its derivative $dF_2/d\ln Q^2$ at small x in the leading order of perturbation theory. The detailed analysis is given for new data of H1 group from HERA. The values of F_L and DIS structure function ratio R are found at $10^{-3} \leq x \leq 2 \cdot 10^{-2}$ and $Q^2 = 20$ GeV^2. 16 refs., 2 figs.

16852 (JINR-R–13-94-393) **Method of the Neutrino Magnetic Moment Measurement up to $3x10^{-12}$ Bohr Magnetons Using Low-Temperature Semiconducting Calorimeter.** Golubchikov, A.V.; Zajmidoroga, O.A.; Smirnov, O.Yu.; Sotnikov, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 14p. (In Russian). Order Number DE95627236. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

It has been shown that if the neutrino magnetic moment is $3x10^{-12}$ of Bohr magnetons or higher, it can be measured from neutrino-electron scattering with monochromatic neutrino source and low-temperature semiconducting calorimeter. (author). 10 refs., 1 tab.

6630 Nuclear Physics

Refer also to citation(s) 17312

16853 (INIS-JP–036) **Annual report of Research Center for Nuclear Physics, Osaka University. April 1, 1993 - March 31, 1994.** Matsuoka, Nobuyuki; Miura, Iwao; Takahisa, Keiji (eds.). Osaka Univ., Ibaraki (Japan). Research Center for Nuclear Physics. 1994. 277p. Order Number DE95768173. Source: OSTI; NTIS; INIS.

This volume of the RCNP annual report gives briefly research activities of the RCNP (Research Center for Nuclear Physics), Osaka University, in the academic year of 1993 (April 1993 - March 1994). RCNP is a national nuclear physics laboratory with the AVF cyclotron and the ring cyclotron. This annual report includes major research activities at RCNP as follows. (1) Low-energy nuclear physics by means of the K=140 MeV AVF cyclotron. Nuclear reactions and nuclear structures were studied. (2) Medium-energy nuclear physics by means of the 0.4 GeV ring cyclotron. The new ring cyclotron is in full operation, and several new progresses in the medium energy nuclear physics have been made. In particular, spin-isospin responses for discrete states, giant resonances and for quasi-free scattering processes have been studied by means of charge exchange reactions. (3) Heavy-ion physics with the secondary radio-active nuclear beams. It includes production of radioactive nuclei with large spin-polarization and studies of snowballs. (4) Non-accelerator physics programs have started in collaboration with the Dept. Phys. group. Neutrino studies by means of double beta decays and dark matter searches by means of scintillators are under progress at the Kamioka underground laboratory. (5) Theoretical works on nuclear structures and nuclear reactions. The RCNP computers are widely used for theoretical studies all over Japan. (6) Developments of accelerators and detector systems. The new external ion-source and the new axial injection line are build in order to increase beam currents. (J.P.N.).

16854 (INIS-mf–14529) **Institute for Radiation Research and Nuclear Physics. Progress report 1990.** Strohmaier, B. (comp.). Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

In this progress report all of the abstracts - except two - are of INIS interest. The topics of the branch sessions are (1) theoretical particle physics (2) nuclear reactions (3) evaluation of nuclear data (4) radionuclide metrology (5) applications of nuclear methods and (6) nuclear information processing. (botek).

16855 (INIS-mf–14530) **Institute for Radiation Research and Nuclear Physics. Progress report 1991.** Strohmaier, B. (comp.). Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

In this progress report all of the abstracts are of INIS interest. The topics of the branch sessions are (1) theoretical particle physics (2) nuclear reactions (3) evaluation of nuclear data (4) applications of nuclear methods and (5) environmental investigations. (botek).

6631 Nuclear Structure

Refer also to citation(s) 16847, 16867, 16881, 16882

16856 (CEA-CONF–11698) **Exotic nuclear shapes - axial and nonaxial octupoles at normal and at super-deformation.** Skalski, J. (Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland)); Heenen, P.H.; Flocard, H.; Meyer, J.; Bonche, P. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1992. 12p. (CONF-9205108–: International conference on nuclear structure at high angular momentum, Ottawa (Canada), 18-21 May 1992). Order Number DE95628980. Source: OSTI; NTIS (US Sales Only); INIS.

Collective octupole dynamics have been studied including nonaxial components of the octupole mean field, mainly at superdeformed shape in the Hg-Pb region. Both the Strutinsky method combined with cranking and the generator coordinate method within the self-consistent Hartree-Fock basis suggest the existence of collective octupole excitations at the superdeformed minima. GCM calculations point out to the E1 transitions as their most prominent experimental manifestation. The influence of the nonaxial octupole components on octupole dynamics in traditional octupole region of Ra-Th nuclei is also discussed. (authors) 38 refs., 6 figs., 1 tab.

16857 (CONF-9410324–1) **Shell model the Monte Carlo way.** Ormand, W.E. Oak Ridge National Lab., TN (United States). [1995]. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; FG05-93ER40770. From International workshop on structure and dynamics of quantum many-body systems; Aizn (Japan); 19-21 Oct 1994. Order Number DE95008783. Source: OSTI; NTIS; INIS; GPO Dep.

The formalism for the auxiliary-field Monte Carlo approach to the nuclear shell model is presented. The method is based on a linearization of the two-body part of the Hamiltonian in an

imaginary-time propagator using the Hubbard-Stratonovich transformation. The foundation of the method, as applied to the nuclear many-body problem, is discussed. Topics presented in detail include: (1) the density-density formulation of the method, (2) computation of the overlaps, (3) the sign of the Monte Carlo weight function, (4) techniques for performing Monte Carlo sampling, and (5) the reconstruction of response functions from an imaginary-time auto-correlation function using MaxEnt techniques. Results obtained using schematic interactions, which have no sign problem, are presented to demonstrate the feasibility of the method, while an extrapolation method for realistic Hamiltonians is presented. In addition, applications at finite temperature are outlined.

16858 (FEI–2345) **Phase transformations in barium, cerium and neodymium isotopes.** Seregin, A.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1993. 18p. (In Russian). Order Number DE95628973. Source: OSTI; NTIS (US Sales Only); INIS.

A method of the definition of the phase transition in experimental dependences is proposed. On the basis of this method the analysis of the energies of the excited states 2_1^+ and 4_1^+ depending on the number of the neutrons is carried out for the barium, cerium and neodymium isotopes. It is shown that these dependences are functions of many figures and consequently they can be regarded as the phase transitions. The meanings of the critical parameters n_c = 81 - 82 and critical index α = 0.5 - 0.6 are found and their dependences from the charge of nucleus and of the spin of states are investigated. 6 refs., 5 figs., 1 tab.

16859 (INIS-mf–14506) **Nuclear data newsletter. No. 20. Nuclear structure and decay data network.** International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Nov 1994. 16p. Order Number DE95628267. Source: OSTI; NTIS (US Sales Only); INIS.

This special issue of the Nuclear Data Newsletter dated November 1994 gives information on the Nuclear Structure and Decay Data (NSDD) Network established in 1974 under the auspices of the IAEA and comprising 17 laboratories and universities in 10 countries. The procedures for online access to US National Nuclear Data Center, NEA Data Bank in Paris and IAEA Nuclear Data Section in Vienna are presented.

16860 (INIS-mf–14529, pp. 7) **Nuclear matter at high densities and temperatures.** Baier, H.; Hejc, G. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MATTER/energy density; NUCLEAR MATTER/nuclear temperature; EQUATIONS OF STATE; PHASE TRANSFORMATIONS; THERMODYNAMIC MODEL

16861 (INIS-mf–14530, pp. 7) **Nuclear matter at finite temperature and density.** Baier, H. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Hejc, G.; Bentz, W. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MATTER/binding energy; EQUATIONS OF STATE; FLUCTUATIONS; HARTREE-FOCK METHOD; MESON-NUCLEON INTERACTIONS

16862 (INP–1603/PH) **Proton impurity in the neutron matter: a nuclear polaron problem.** Kutschera, M. (Institute of Nuclear Physics, Cracow (Poland)); Wojcik, W. Institute of Nuclear Physics, Cracow (Poland). Oct 1992. 26p. Grant KBN 20204 91 01. Order Number DE95628974. Source: OSTI; NTIS; INIS.

We study interactions of a proton impurity with density oscillations of the neutron matter in a Debye approximation. The proton-phonon coupling is of the deformation-potential type at long wavelengths. It is weak at low density and increases with the neutron matter density. We calculate the proton's effective mass perturbatively for a weak coupling, and use a canonical transformation technique for stronger couplings. The proton's effective mass grows significantly with density, and at higher densities the proton impurity can be localized. This behaviour is similar to that of the polaron in solids. We obtain properties of the localized proton in the strong coupling regime from variational calculations, treating the neutron in the Thomas-Fermi approximation. (author). 14 refs, 8 figs.

16863 (INP–1606/PH) **Self-consistent proton crystallization in dense neutron star matter.** Kutschera, M. (Institute of Nuclear Physics, Cracow (Poland)); Wojcik, W. Institute of Nuclear Physics, Cracow (Poland). Nov 1992. 23p. Grant KBN 20204 91 01. Order Number DE95628975. Source: OSTI; NTIS; INIS.

We construct a solid-like variational wave functions for protons localized in dense neutron star matter. The localized protons are centered on the lattice sites and the neutron background is described by periodic Bloch wave functions. The self-consistent periodic structure arises due to a collective mean field. For low proton fraction the periodic potential is weak and the neutron Fermi surface is well approximated by a sphere. With the Skyrme forces we find that the proton solid is of lower energy than a uniform matter for densities above $n_l \approx 4\ n_0$, where $n_0 = 0.17\ fm^{-3}$ is the nuclear saturation density. We discuss implications of the proton crystallization for properties of dense matter in neutron stars. (author). 7 refs, 8 figs.

16864 (INP–1641/PH) **Nuclear symmetry energy and structure of dense matter in neutron stars.** Kutschera, M. (Institute of Nuclear Physics, Cracow (Poland)). Institute of Nuclear Physics, Cracow (Poland). Jul 1993. 10p. Grant KBN 20204 91 01; Grant KBN 20054 91 01. Order Number DE95628976. Source: OSTI; NTIS; INIS.

Consequences for neutron star matter of the behaviour of symmetry energy which results in disappearing of protons at high densities are explored. It is shown that interactions responsible for disappearance of protons tend to separate protons and neutrons at lower densities. Two separation mechanisms are considered: a bulk separation of protons and neutrons and formation of a neutron bubble around a single proton. The latter one corresponding to trapping of protons in the neutron background bubbles is more likely to occur in neutron star matter. In this case protons form polarons which are localized. (author). 16 refs, 2 figs.

16865 (JINR-E–3-94-403) **Excitation Study of High-Lying States of Differently Shaped Heavy Nuclei by the Method of Two-Step Cascades.** Boneva, S.T.; Khitrov, V.A.; Sukhovoj, A.M.; Vojnov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 18p. Order Number DE95627249. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics. A.

Recently obtained primary transition intensities from two-step gamma-ray cascade investigation in 14 heavy nuclei: ^{137,138,139}Ba, ^{146}Nd, ^{150}Sm, ^{156,158}Gd, ^{160}Tb, ^{164}Dy, ^{168}Er, ^{174}Yb, ^{181}Hf, ^{196}Pt, ^{198}Au are analyzed. Experiments based on thermal neutron capture were undertaken mainly at the Frank Laboratory of Neutron Physics. Comparing these measured intensities and statistical model predictions, some properties of compound-state depopulation were derived. For the spherical nuclei of ^{137,138,139}Ba and ^{146}Nd very intense cascades with high-energy primary transitions were observed. Rather different is the behaviour of the cascade intensity in the strongly deformed nuclei of ^{156,158}Gd, ^{160}Tb, ^{164}Dy, ^{168}Er and in transitional nucleus of ^{150}Sm -intensity of primary gamma-rays with $E_1 \approx$ 2-3 MeV overestimates the calculated value by more than one order of magnitude. 22 refs., 5 figs., 3 tabs.

6632 Radioactivity and Electromagnetic Transitions (Excluding Fission)

Refer also to citation(s) 16846

16866 (INIS-mf–14529, pp. 23-25) **Investigation of the E1 gamma-ray strength in deformed nuclei.** Kopecky, J. (Netherlands Energy Research Foundation (ECN), Petten (Netherlands)); Uhl, M. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DEFORMED NUCLEI/e1-transitions; E1-TRANSITIONS/strength functions; E1-TRANSITIONS; ENERGY DEPENDENCE; EUROPIUM ISOTOPES; FERMI GAS; GADOLINIUM 156; GAMMA RADIATION; GIANT RESONANCE; LORENTZ FORCE; LUTETIUM 175; RHENIUM ISOTOPES; SINGLE-PARTICLE MODEL; SPIN FLIP; TANTALUM 181; THULIUM 169; TUNGSTEN ISOTOPES

6633 Nuclear Reactions and Scattering, General

Refer also to citation(s) 16891, 16903, 16904, 16906, 16908, 17397

16867 (INIS-mf–14530, pp. 9) **Distribution of radiative strength in ^{156}Gd, ^{157}Gd and ^{158}Gd nuclei.** Kopecky, J. (Netherlands Energy Research Foundation (ECN), Petten (Netherlands)); Uhl, M.; Chrien, R.E. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GADOLINIUM 156/distribution; GADOLINIUM 156/strength functions; GADOLINIUM 157/strength functions; GADOLINIUM 158/strength functions; CAPTURE; COMPOUND NUCLEI; CROSS SECTIONS; EXPERIMENTAL DATA; DISTRIBUTION; GAMMA RADIATION; GAMMA SPECTRA; NEUTRON REACTIONS

16868 (INIS-mf–14530, pp. 10) **Model calculations of ^{48,50}Ti(n,$\alpha\gamma$) activation cross sections.** Qaim, S.M. (Forschungszentrum Juelich GmbH (Germany)); Uhl, M. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CALCULATION METHODS/cross sections; CALCULATION METHODS/titanium 48; CALCULATION METHODS/titanium 50; ALPHA PARTICLES; EXCITATION FUNCTIONS; EXCITON MODEL; EXPERIMENTAL DATA; INELASTIC SCATTERING; MATHEMATICAL MODELS; NEUTRON REACTIONS; NUCLEAR MODELS

16869 (JINR-E–2-94-380) **Percolation Model of Nuclear Multifragmentation in High Energy Nucleus-Nucleus Interactions.** Abdel-Waged, Kh. (Benha Univ. (Egypt). Dept. of Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 12p. Order Number DE95627288. Source: OSTI; NTIS (US Sales Only); INIS.

A hybrid model based on Reggeon theory inspired model of nuclear distribution, which was successful in explaining the cascading of particles in high energy nucleus-nucleus interactions, and percolation model is proposed. In the framework of this model the yield of the fragment in p + Ag, Au at 350 GeV and C + Ag, Au at 3.6 GeV/nucleon as well as the charge distribution of fragments in Kr, Xe and U interactions with emulsion at $\approx$ 1 GeV/nucleon is correctly described. 32 refs., 3 figs.

16870 (JINR-E–15-94-408) **Isomeric Targets and Beams.** Oganesyan, Yu.Ts.; Karamyan, S.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 26p. Order Number DE95627287. Source: OSTI; NTIS (US Sales Only); INIS.

To be published in Proceedings of the International Conference on Nuclear Shapes and Nuclear Structure, Antibes, France, 20-25 Jun 1994.

One of the main topics of modern nuclear physics is the investigation of exotic nuclei including hyper-nuclei, trans fermium elements, proton and neutron rich isotopes near drip lines as well as high-spin excited states and states with anomalous deformation. The isomerism of nuclei is closely related with such phenomena as the alignment of single-particle orbitals, the coexistence of various deformations and the manifestation of intruder-levels from neighbouring shells. The investigation of electromagnetic and nuclear interactions of isomers could give important information on their shell structure and its role in the mechanism of nuclear reactions. For such experiments one can either make isomeric targets (sufficiently long-lived) or use the methods of acceleration of isomeric nuclei. Recently, an exotic 16^+ four-quasiparticle isomer of ^{178}Hf$^m_2$ was produced in a micro weight quantity and the first nuclear reactions on it were successfully observed. The talk describes these experiments as well as new ideas for the continuation of the studies and some advantageous ways for the isomeric beams production by the method of direct acceleration or by the secondary beam method. 35 refs., 15 figs., 8 tabs.

6634 Specific Nuclear Reactions and Scattering

Refer also to citation(s) 16221

16871 (BNL–61149, pp. 213-218) **Excitation function for ^{178}W production in the ^{181}Ta(p,4n)^{178}W reaction over proton energy range 28.8-71.8 MeV.** Zaitseva, N.G. (Joint Institute for Nuclear Research, Dubna (Russian Federation)); Khalkin, V.A.; Stegailov, V.I.; Rurarz, E.; Popinenkova, L.M. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Among the more attractive radionuclides for lung and liver imaging in children and adults, particularly in cardiovascular examinations, is ^{178}Ta. This radionuclide is readily available from the radionuclide generator ^{178}W EC ($T_{1/2}$ = 21.7d) ^{178}Ta EC,β^+($T_{1/2}$ = 9.3min) ^{178}Hf (stable). The long lived ^{178}W ($T_{1/2}$ = 21.7d) decay entirely by EC to 9.3 m ^{178}Ta daughter without feeding the high spin isomer ($T_{1/2}$ = 2.2 h) in ^{178}Ta. The short lived ^{178}Ta then decays to stable ^{178}Hf, 98.2% by EC and 1.1% by β^+ emission. In this paper, the authors report the excitation function for the ^{181}Ta(p,4n)^{178}W reaction in the proton energy range of 28.8-71.8 MeV.

16872 (BNL–61149, pp. 226-231) **Determination of excitation functions for ^{20}Ne(p,p2n)^{18}Ne $\rightarrow$ ^{18}F and ^{20Ne}(p,2n)^{18}F and a reexamination of production of [^{18}F]F_2 with protons on neon.** Reddy, G.N. (Paul Scherrer Institute, Villigen PSI (Switzerland)); Beer, H.F.; Schubiger, P.A. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

[^{18}F]F-Labelled radiopharmaceutical continue to play a major role for the development of positron emission tomography (PET) as an in vivo modality in biomedical research. The half-life (109.6 min) of [^{18}F]F provides an ideal time for PET investigations. It could be produced in two reactive Forms: (a) as nucleophilic fluoride and (b) as electrophilic fluorine gas. The most commonly employed two nuclear processes are: ^{20}Ne(d,α)^{18}F and ^{18}O(p,n)^{18}F. The latter process is predominantly used for the production of NCA [^{18}F]fluoride by bombarding [^{18}O] water with protons and has been studied elaborately. The former process is mostly used for the production of carrier-added [^{18}F]F_2 by deuteron bombardment. Generation of [^{18}F]F_2 with protons on [^{18}O]O_2 has been implemented, but this method needs optimization. Thus, PET centers that do not have dual particle accelerators are limited in methods for the production of [^{18}F]F_2. Nonetheless, the PET centers with medium energy proton (35-40 MeV) cyclotrons, have a better probability for the production of [^{18}F]F_2. It could be generated by ^{20}Ne(p,x)^{18}F reaction. This process has not been studied in detail and is being used only at TRIUMPH, UBC PET Center in Vancouver, Canada. At this Institute, two injectors of proton energy 72 MeV are in use for isotope production and hence this nuclear process was examined in detail.

16873 (BNL–61514) **Pion interferometry in E814 – Toward equilibrium at the AGS.** Xu, N. (State Univ. of New York, Stony Brook, NY (United States). Dept. of Physics). E814 Collaboration. Brookhaven National Lab., Upton, NY (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950180–1: 10. winter workshop on nuclear dynamics, Snowbird, UT (United States), 15-21 Jan 1995). Order Number DE95008860. Source: OSTI; NTIS; INIS; GPO Dep.

The ultimate goal of ultra-relativistic heavy-ion program at the BNL AGS and CERN SPS is to study highly excited nuclear matter

and the transition from hadronic matter to quark gluon plasma. In the QGP state, quarks and gluons are no longer confined but they move freely in a fairly large volume. According to their knowledge, the de-confined state can be approached via either compression or heating of nuclear matter in heavy-ion collisions. At AGS energies, the most relevant process is believed to be compression. However, before the authors try to identify any exotic events such as, for example QGP phase transition or chiral symmetry restoration, they have to answer the following questions: (1) Were the densities(due to the compression) high enough? (2) Was the high density region large enough? (3) Was the system thermalized? The authors report recent pion interferometry results from AGS experiment E814. By comparing to the results of RQMD calculations, a freeze-out size R_{rms} = 8.3 fm is found in Si + Pb central collisions. A consistent thermal equilibration picture is established by comparing experimental data with the results of both hydrodynamic and cascade model calculations.

16874 (BNL–61522) **Particle production at AGS energies.** Steadman, S.G. (Massachusetts Institute of Technology, Cambridge, MA (United States)); Rothschild, P.J.; Sung, T.W.; Zachary, D. Brookhaven National Lab., Upton, NY (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940169–11: 10. winter workshop on nuclear dynamics, Snowbird, UT (United States), 15-21 Jan 1994). Order Number DE95008856. Source: OSTI; NTIS; INIS; GPO Dep.

The authors discuss particle production from 14.6 A·GeV/c Si and 11.6 A·GeV/c Au projectiles on Al and Au targets. The second-level trigger utilized by E859 allows high precision measurements of K^-, $\bar{p}$, Λ and $\bar{\Lambda}$. The $\bar{\Lambda}$ yield is larger than expected, and a surprisingly large fraction of the $\bar{p}$'s are observed to arise from the decay of $\bar{\Lambda}$.

16875 (CONF-9409150–1) **Study of heavy ion collisions ^{58}Ni + ^{24}Mg and ^{79}Br + ^{27}Al at 11 MeV/nucleon.** Shapira, D. (Oak Ridge National Lab., TN (United States)); Gomez Del Campo, J.; Korolija, M.; Chavez, E.L.; Ortiz, M.E.; Dacal, A. Oak Ridge National Lab., TN (United States). 23 Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From CAM '94: Canadian-American-Mexican physics meeting; Cancun (Mexico); 26-30 Sep 1994. Order Number DE95010279. Source: OSTI; NTIS; INIS; GPO Dep.

Nucleus-nucleus fusion and factors governing it has been the subject of many studies below the Coulomb barrier up to bombarding energies near 10 MeV/nucleon. Understanding of this process has increased during the last few decades, but there remain outstanding questions such as: fusion below the nucleus-nucleus Coulomb barrier resonances in light systems, and cross section magnitudes for heavier systems, saturation of fusion cross sections at high bombarding energies in light nuclear system, and emission of light particles from hot compound nuclei at energies well below the separation barrier, to name a few. At bombarding energies between 10 and 10O MeV/nucleon processes other than complete fusion become important, and interpretation of reaction data becomes increasingly complicated. Exclusive studies of particle production in nuclear reactions at these energies mandate the use of large arrays of particle detectors. The work reported here presents results of studies at the lower end of this energy range performed with a large detector array for charged particles-HILI; it concentrates on the nickel-58 + magnesium-24 reaction.

16876 (DOE/ER/40370–7) **Theory of photon and electron induced reactions. Progress report, July 1, 1994–June 30, 1995.** Onley, D.S.; Wright, L.E. Ohio Univ., Athens, OH (United States). Dept. of Physics and Astronomy. Mar 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER40370. Order Number DE95010535. Source: OSTI; NTIS; INIS; GPO Dep.

During the first year and half of the current grant from the Department of Energy the authors have made considerable progress on the following aspects of the general investigation of electron and photon induced reactions: (a) photo and electroproduction of mesons from nuclei; (b) approximate Coulomb distortion effects on (e,e′) and (e,e′p) in the quasi-elastic region; and (c) quark models. The authors report on each of these developments in the following sections.

16877 (FEI–2363) **Inelastic neutron spectra and cross sections for ^{238} U.** Kornilov, N.V.; Kagalenko, A.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1994. 24p. (In Russian, English). Order Number DE95628985. Source: OSTI; NTIS (US Sales Only); INIS.

The report discusses the experimental facilities of IPPE, results of spectra and cross sections investigations. The problems of existing data libraries were highlighted. Some of these problems for example, inelastic spectra at high energy may be solved by correct theoretical calculation. Others like level cross sections at E > 2 MeV and the possible structure of excitation function for group levels between 0.5 to 0.85 MeV demand new experimental efforts. 21 refs., 11 figs., 5 tabs.

16878 (FNAL/C–95/018) **Some highlights of the recent Fermilab Fixed Target Program of interest to the nuclear physics community.** Conrad, J. (Columbia Univ., New York, NY (United States)); Papavassiliou, V.; Zielinski, M. Fermi National Accelerator Lab., Batavia, IL (United States). Feb 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-950165–2: DNP/NSAC town meeting on nuclear physics with intermediate energy and high-energy hadron probes, Chicago, IL (United States), 29-30 Jan 1995). Order Number DE95009108. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the high energy physics questions addressed by the Fermilab Fixed Target Experiments are also of interest to the members of the nuclear community. Some recent highlights of the program, including studies of A-dependence of cross sections, evidence for parton rescattering in nuclear media, studies of heavy quark production, evidence for color transparency, and insights into QCD from meson systems, are discussed.

16879 (GSI–95-09(prepr.)) **The photodissociation of ^{8}B and the solar neutrino problem.** Bertulani, C.A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jan 1995. 36p. Order Number DE95770054. Source: OSTI; NTIS (US Sales Only); INIS.

The extraction of the photodissociation cross sections of ^{8}B from Coulomb dissociation experiments is investigated. A careful study is done on the contributions of the E1, E2 and M1 multipolarities to the breakup. A comparison with the data of a recent experiment is performed. It is shown that the extraction of the radiative capture cross sections ^{7}Be(p, γ)^{8}B which are relevant for the solar neutrino problem is not affected appreciably by Coulomb reacceleration. A non-perturbative model is used for the purpose. Emphasis is put on the perspectives for future experiments which are planned at the University of Notre Dame, RIKEN (Japan), and GSI (Germany). An analysis of the total yields of "photon-point" processes in inelastic electron scattering is also done. (orig.)

16880 (GSI–95-10(prepr.)) **Probing the ground state and transition densities of halo nuclei.** Bertulani, C.A. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Sagawa, H. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jan 1995. 32p. Order Number DE95770053. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the use of elastic and inelastic scatterings with secondary beams of radioactive nuclei as a mean to obtain information on ground state densities and transition matrix elements to continuum states. An eikonal model is developed for this purpose by using the folding potential. In particular we discuss possible signatures of halo wavefunctions in elastic and inelastic scattering experiments. (orig.)

16881 (GSI–95-11(prepr.)) **The disappearance of flow.** Soff, S. (Frankfurt Univ. (Germany). Inst. fuer Theoretische Physik); Bass, S.A.; Hartnack, C.; Stoecker, H.; Greiner, W. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jan 1995. 20p. Order Number DE95770051. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the disappearance of collective flow in the reaction plane in heavy-ion collisions within a microscopic model (QMD). A systematic study of the impact parameter dependence is performed for the system Ca+Ca. The balance energy strongly increases with impact parameter. Momentum dependent interactions

reduce the balance energies for intermediate impact parameters b≈4.5 fm. Dynamical negative flow is not visible in the laboratory frame but does exist in the contact frame for the heavy system Au+Au. For semi-peripheral collisions of Ca+Ca with b≈6.5 fm a new two-component flow is discussed. Azimuthal distributions exhibit strong collectiv flow signals, even at the balance energy. (orig.)

16882 (GSI–95-13(prepr.)) **Probing the nuclear liquid-gas phase transition.** Pochodzalla, J. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Moehlenkamp, T.; Rubehn, T.; Schuettauf, A.; Woerner, A.; Zude, E. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Feb 1995. 15p. Order Number DE95770028. Source: OSTI; NTIS (US Sales Only); INIS.

Fragment distributions resulting from Au+Au collisions at an incident energy of E/A=600 MeV are studied. From the measured fragment and neutron distributions the mass and the excitation energy of the decaying pre-fragments were determined. A temperature scale was derived from observed yield ratios of He and Li isotopes. The relation between this isotope temperature and the excitation energy of the system exhibits a behavior which is expected for a phase transition. The nuclear vapor regime takes over at an excitation energy of 10 MeV per nucleon, a temperature of 5 MeV and may be characterized by a density of 0.15-0.3 normal nuclear density. (orig.)

16883 (IAEA-NDS–138) **JENDL-3.2/FPY. The JENDL-3.2 fission-product yield data library. Contents and documentation.** IAEA-NDS-Documentation series, IAEA-NDS-Documentation series. Lemmel, H.D. (ed.); Nakagawa, T. (comp.). International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Jul 1994. 2p. Order Number DE95628997. Source: OSTI; NTIS (US Sales Only); INIS.

This data library contains neutron-induced fission-product yield data for ten fissile nuclides, some of them at 3 incident neutron energies, including independent yields and cumulative yields. The data library, which is in ENDF-6 format, is available, costfree, on magnetic tape or on diskette(s). (author).

16884 (IAEA-NDS–168) **The processed neutron activation cross-section data files of the FENDL project. Summary documentation.** IAEA-NDS-Documentation series, IAEA-NDS-Documentation series. Ganesan, S. (and others); Pashchenko, A.B.; Lemmle, H.D. (eds.); Mann, F.M. International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Sep 1994. 2p. Order Number DE95628986. Source: OSTI; NTIS (US Sales Only); INIS.

This document summarises a neutron activation cross-section database which has been processed in two formats for input to MCNP Monte Carlo codes and to REAC transmutation codes. The data are available from the IAEA Nuclear Data Section online via INTERNET by FTP command. (author).

16885 (INDC(CCP)–382) **Properties of standard-I mass channel in fission of Z-ODD nuclei.** Goverdovsky, A.A. (Institute of Physics and Power Engineering, Obninsk (Russian Federation)); Mitrofanov, V.F.; Khryachkov, V.A. International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Dec 1994. 11p. Contract 93-02-3799. Order Number DE95628998. Source: OSTI; NTIS (US Sales Only); INIS.

Mass distributions of fission fragments in Am-243 (n,f) reaction have been measured for incident neutron energy from 1 to 3.7 MeV. The data were analyzed along the Brosa model. The attention was paid to behaviour of standard-I component which was observed to be strongly determined by excitation energy of the fissile system at the top of fission barrier. Results of the analysis showed that FF mass spectra of americium isotopes can be predicted for any incident neutron energy. The comparison with the data for other Am-nuclei measured is given. (author). 14 refs, 6 figs, 1 tab.

16886 (INDC(NDS)–323) **Improvement of measurements, theoretical computations and evaluations of neutron induced helium production cross sections. Summary report of the second research co-ordination meeting held in Beijing, China, from 1 to 4 November 1994.** Pashchenko, A.B. International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Feb 1995. 21p. (CONF-9411145–: IAEA conference on improvement of measurements, theoretical computations, and evaluations of neutron-induced helium production cross sections, Beijing (China), 1-4 Nov 1994). Order Number DE95628987. Source: OSTI; NTIS (US Sales Only); INIS.

The report contains the Summary of the 2nd Research Coordination Meeting (RCM) of the IAEA Co-ordinated Research Programme (CRP) on "Improvement of Measurements, Theoretical Computations and Evaluations of Neutron Induced Helium Production Cross Sections". The meeting was organized by the IAEA Nuclear Data Section (NDS) with co-operation and assistance of local organizers from the China Institute of Atomic Energy and held in Beijing, China, from 1 to 4 November 1994. The purpose of the RCM was to discuss the results obtained by the participating institutes under the CRP, to review the status of helium production cross section data and to work out a coordinated working programme for the participants. The meeting agenda, conclusions and recommendations, and the list of participants are presented in the summary report. (author).

16887 (INDC(USA)–106) **A survey of selected neutron-activation reactions with short-lived products of importance to fusion reactor technology.** Ward, R.C. (Rensselaer Polytechnic Inst., Troy, NY (United States). Dept. of Nuclear Engineering and Engineering Physics); Gomes, I.C.; Smith, D.L. International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Nov 1994. 88p. Order Number DE95628988. Source: OSTI; NTIS (US Sales Only); INIS.

The status of the cross sections for production of short-lived radioactivities in the intense high-energy neutron fields associated with D-T fusion reactors is investigated. The main concerns relative to these very radioactive isotopes are with radiation damage to sensitive components such as superconducting magnets, the decay-heat problem and the safety of personnel during operation of the facility. The present report surveys the status of nuclear data required to assess these problems. The study is limited to a few high-priority nuclear reactions which appear to be of critical concern in this context. Other reactions of lesser concern are listed but are not treated in the present work. Among the factors that were considered in defining the relevant reactions and setting priorities are: quantities of the elemental materials in a fusion reactor, isotopic abundances within elemental categories, the decay properties of the induced radioactive byproducts, the reaction cross sections, and the nature of the decay radiations. Attention has been focused on radioactive species with half lives in the range from about 1 second to 15 minutes. Available cross-section and reaction-product decay information from the literature has been compiled and included in the report. Uncertainties have been estimated by examining several sets of experimental as well as evaluated data. Comments on the general status of data for various high-priority reactions are offered. On the basis of this investigation, it has been found that the nuclear data are in reasonably good shape for some of the most important reactions but are unacceptable for others. Based on this investigation, the reactions which should be given the greatest attention are: $^{16}O(n,p)^{16}N$, $^{55}Mn(n,p)^{55}Cr$, $^{57}Fe(n,p)^{57}Mn$, $^{186}W(n,2n)^{185m}W$, and $^{207}Pb(n,n')^{207m}Pb$. (Abstract Truncated)

16888 (INIS-mf–14483, pp. 3-8) **Study of $^{124}Te(n,\gamma)^{125}Te$ reaction with thermal neutrons.** Honzatko, J. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Jaderne Fyziky); Konecny, K.; Tomandl, I.; Dobes, J.; Alexa, P. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

The γ-rays following thermal neutron capture in ^{124}Te were studied by γ-γ coincidence measurements. A level scheme consisting of 51 levels including 190 transitions was established up to the excitation energy of 3 MeV. The isomer production cross section was

determined to be greater than 0.9 b. The energy levels are compared with the Intermediate Coupling Model and the Interacting Boson-Fermion Model. (author) 3 figs., 11 refs.

16889 (INIS-mf–14483, pp. 150) **Radiation capture of thermal neutrons in ^{124}Te.** Honzatko, J. (Ceska Akademie Ved, Rez (Czech Republic). Ustav Jaderne Fyziky); Konecny, K.; Tomandl, I.; Dobes, J.; Alexa, P.; Rikovska, J. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TELLURIUM 124 TARGET/neutron reactions; CAPTURE; COINCIDENCE SPECTROMETRY; ENERGY LEVELS; ENERGY-LEVEL TRANSITIONS; INTERACTING BOSON MODEL; ISOMER RATIO; PROMPT GAMMA RADIATION; QUASIPARTICLE-PHONON MODEL; TELLURIUM 125

16890 (INIS-mf–14529, pp. 8) **Determination of the ^{60}Ni(n,2n)^{59}Ni cross section using accelerator mass spectroscopy.** Nolte, E. (Dept. of Physics, Technical Univ. Muenchen, Munich (Germany)); Korschinek, G.; Ruehm, W.; Schneck, B.; Weselka, D.; Zerle, L.; Vonach, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/accelerators; NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/mass spectroscopy; HALF-LIFE; MEASURING METHODS; ACCELERATORS; NICKEL 59; NICKEL 60

16891 (INIS-mf–14529, pp. 9) **Investigations of (n,xnγ) reactions on lead isotopes for neutron energies up to 100 MeV.** Haight, R.C. (Los Alamos National Lab., NM (United States)); Nelson, R.O.; Wender, S.A.; Pavlik, A.; Vonach, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STABLE ISOTOPES/gamma radiation; STABLE ISOTOPES/measuring methods; COLLIMATORS; CROSS SECTIONS; GERMANIUM; LEAD 207; NEUTRON REACTIONS; RADIATION DETECTORS; TIME-OF-FLIGHT METHOD

16892 (INIS-mf–14529, pp. 9-10) **Measurement of neutron-induced fission cross sections for ^{206}Pb and ^{208}Pb.** Pavlik, A. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Vonach, H.; Wender, S.A. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/fission; NEUTRON REACTIONS/neutrons; COUNTING RATES; ENERGY; FISSION CHAMBERS; FISSION FRAGMENTS; IONIZATION CHAMBERS; LEAD 206; LEAD 208; MEASURING METHODS; FISSION; NEUTRONS; STAINLESS STEELS; URANIUM 238

16893 (INIS-mf–14529, pp. 10-11) **The ^{238}U(n,f) cross section and its ratio to the ^{27}Al(n,α)^{24}Na and ^{56}Fe(n,p)^{56}Mn cross section in the 14 MeV region.** Winkler, G. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Wagner, M.; Lewis, V.E.; Ryves, T.B. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/uranium 238; ALPHA PARTICLES; ALUMINIUM 27; IRON 56; MEV RANGE 10-100; NEUTRONS; SODIUM 24

16894 (INIS-mf–14529, pp. 11-12) **Measurement of the ^{60}Ni(n,p)^{60}Co cross section in the neutron energy range 6-13 MeV.** Wagner, M. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Vonach, H.; Haight, R.C. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EXCITATION FUNCTIONS/cobalt 60; EXCITATION FUNCTIONS/nickel 60; NEUTRON REACTIONS/cobalt 60; NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/nickel 60; ACCELERATORS; FOILS; MEV RANGE 01-10; MEV RANGE 10-100; NEUTRONS; PROTONS; URANIUM 238

16895 (INIS-mf–14529, pp. 12-15) **Activation cross-section measurements for the reactions ^{58}Ni(n,p)^{58}Co and ^{93}Nb(n,2n)^{92m}Nb in the 5-13 MeV energy region.** Vonach, H. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Wagner, M.; Haight, R.C. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NICKEL 58 TARGET/neutron reactions; NIOBIUM 93 TARGET/neutron reactions; ACCELERATORS; COBALT 58; CROSS SECTIONS; DEUTERIUM; HELIUM 3; HYDROGEN; IONIZATION CHAMBERS; MEV RANGE 01-10; MEV RANGE 10-100; NEUTRONS; NIOBIUM 92; PROTONS; URANIUM 238

16896 (INIS-mf–14529, pp. 15-18) **Measurement of the ^{23}Na(n,2n)^{22}Na cross section at E_n=19.45 MeV and re-evaluation of the ^{23}Na(n,2n)^{22}Na excitation function.** Wagner, M.; Strohmaier, B.; Vonach, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/excitation functions; SODIUM 23 TARGET/neutron reactions; COBALT 57; MEV RANGE 10-100; NEUTRONS; NICKEL 58; SODIUM 22; VAN DE GRAAFF ACCELERATORS

16897 (INIS-mf–14529, pp. 19-20) **Investigation of (α,xn)- and (α,αxn) reactions for α + ^{107,109} Ag at incident energies between 20 and 60 MeV.** Guin, R. (Bhabha Atomic Research Centre, Bombay (India)); Uhl, M. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALPHA REACTIONS/silver 107; ALPHA REACTIONS/silver 109; ALPHA PARTICLES; ANGULAR MOMENTUM; BARC; CROSS SECTIONS; EXCITATION FUNCTIONS; EXCITON MODEL; FOILS; INDIUM 110; ISOMERIC TRANSITION ISOTOPES; MEV RANGE 10-100; TRANSMISSION

16898 (INIS-mf–14529, pp. 26) **IRK evaluations of neutron-dosimetry reactions.** Wagner, M.; Vonach, H.; Pavlik, A.; Strohmaier, B.; Tagesen, S.; Martinez-Rico, J. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DOSIMETRY/evaluated data; NEUTRON DOSIMETRY/neutron reactions; ALPHA PARTICLES; ALUMINIUM 27; CHROMIUM ISOTOPES; COBALT ISOTOPES; COPPER 64; CROSS SECTIONS; GOLD ISOTOPES; MAGNESIUM 24; NICKEL ISOTOPES; NIOBIUM ISOTOPES; PROTONS; SODIUM 24; STATISTICAL MODELS; ZINC 64; ZIRCONIUM ISOTOPES

16899 (INIS-mf–14529, pp. 27-29) **Detailed study of uncertainties and correlations in the neutron nuclear data of ^{52}Cr, ^{56}Fe, ^{58}Ni and ^{60}Ni for the Eurcpean fusion file.** Vonach, H.; Tagesen, S. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear*

Physics. Progress report 1990. 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHROMIUM 52/nuclear data collections; IRON 56/nuclear data collections; NICKEL 58/nuclear data collections; NICKEL 60/nuclear data collections; NUCLEAR DATA COLLECTIONS/correlations; NUCLEAR DATA COLLECTIONS/data covariances; CROSS SECTIONS; EVALUATED DATA; NEUTRONS; CORRELATIONS; NUCLEAR MODELS

16900 (INIS-mf–14529, pp. 30-36) **Evaluation of 14 MeV cross sections for the main isotopes of the structural materials Cr, Fe and Ni.** Tagesen, S.; Vonach, H.; Wagner, M.; Pavlik, A. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 tabs., 4 figs. CHROMIUM 52/neutron reactions; IRON 56/neutron reactions; NICKEL 58/neutron reactions; NICKEL 60/neutron reactions; CROSS SECTIONS; ELASTIC SCATTERING; EVALUATED DATA; EXPERIMENTAL DATA; MEV RANGE 10-100; NEUTRONS; TOTAL CROSS SECTIONS

16901 (INIS-mf–14530, pp. 9) **The sensitivity of statistical model neutron capture calculations to model assumptions.** Uhl, M. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Kopecky, J. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STATISTICAL MODELS/capture; STATISTICAL MODELS/neutron reactions; STATISTICAL MODELS/sensitivity; CROSS SECTIONS; DEFORMED NUCLEI; ENERGY-LEVEL DENSITY; GAMMA RADIATION; OPTICAL MODELS; CAPTURE; SENSITIVITY; STRENGTH FUNCTIONS

16902 (INIS-mf–14530, pp. 11-13) **Nuclear-model calculations of cross sections of neutron-induced reactions on ^{23}Na up to 20 MeV.** Strohmaier, B. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR MODELS/cross sections; NUCLEAR MODELS/neutron reactions; NUCLEAR MODELS/sodium 23; ALPHA PARTICLES; DEUTERONS; EXCITATION FUNCTIONS; EXCITON MODEL; EXPERIMENTAL DATA; MEV RANGE 10-100; PROTONS; SODIUM 22; TRANSMISSION

16903 (INIS-mf–14530, pp. 17-20) **Measurement of the activation cross section for the reaction ^{93}Nb(n,n')^{93m}Nb in the energy range 6-9 MeV.** Wagner, M. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Vonach, H.; Haight, R.C. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/niobium 93; ENERGY SPECTRA; EXCITATION FUNCTIONS; FOILS; MEV RANGE 01-10; NEUTRON DOSIMETRY; NEUTRON MONITORS; VAN DE GRAAFF ACCELERATORS

16904 (INIS-mf–14530, pp. 20-22) **Investigation of (n,xnγ) reactions on lead isotopes for neutron energies up to 100 MeV.** Pavlik, A. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Vonach, H.; Chadwick, M.; Haight, R.C.; Nelson, R.O.; Wender, S.A.; Young, P.G. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/lead isotopes; NEUTRON REACTIONS/mev range 10-100; CORRECTIONS; EXCITATION FUNCTIONS; EXCITON MODEL; GAMMA SPECTRA; HAUSER-FESHBACH THECRY; ISOMERIC NUCLEI; LEAD 208; MATHEMATICAL MODELS; NUCLEAR MODELS

16905 (INIS-mf–14530, pp. 22-23) **Measurement of neutron-induced fission cross sections for ^{206}Pb and ^{208}Pb.** Pavlik, A. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Vonach, H.; Wender, S.A. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEAD 206 TARGET/fission; LEAD 208 TARGET/fission; CROSS SECTIONS; FISSION; NEUTRON REACTIONS; URANIUM 238

16906 (INIS-mf–14530, pp. 23-24) **The ^{238}U(n,f) cross section and its ratio to the ^{27}Al(n,α)^{24}Na and ^{56}Fe(n,p)^{56}Mn cross section in the 14 MeV region.** Winkler, G. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik); Wagner, M.; Lewis, V.E.; Ryves, T.B. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/cross sections; NEUTRON REACTIONS/uranium 238; ALPHA PARTICLES; ALUMINIUM 27; FISSION; FISSION CHAMBERS; IRON 56; MANGANESE 56; MEV RANGE 10-100; NEUTRON FLUENCE; PROTONS; SODIUM 24

16907 (INIS-mf–14530, pp. 24) **Prerequisites for accurate activation cross-section measurements.** Winkler, G. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON REACTIONS/cross sections; ENERGY DEPENDENCE; EXCITATION; EXPERIMENTAL DATA; FAST NEUTRONS

16908 (INIS-mf–14530, pp. 25-27) **Update of the evaluation of the cross sections for the neutron-dosimetry reactions ^{19}F(n,2n)^{18}F and ^{93}Nb(n,2n)^{92m}Nb.** Wagner, M. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FLUORINE 19 TARGET/neutron reactions; NIOBIUM 93 TARGET/neutron reactions; CROSS SECTIONS; EXCITATION FUNCTIONS; EXPERIMENTAL DATA; FLUORINE 18; MEV RANGE 10-100; NEUTRON DOSIMETRY; NIOBIUM 92

16909 (INIS-mf–14530, pp. 27) **Evaluation of angle-integrated neutron-emission cross sections from the interaction of 14MeV neutrons with medium-mass and heavy nuclei.** Pavlik, A.; Vonach, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON EMISSION/cross sections; COORDINATED RESEARCH PROGRAMS; EVALUATION; HEAVY NUCLEI; IAEA; MEV RANGE 10-100; NEUTRONS; THERMONUCLEAR REACTORS

16910 (INIS-mf–14530, pp. 28) **Detailed study of uncertainties and correlations in the neutron nuclear data of ^{52}Cr, ^{56}Fe, ^{58}Ni and ^{60}Ni for the European Fusion File.** Tagesen, S.; Vonach, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CHROMIUM 52/nuclear data collections; IRON 56/nuclear data collections; NICKEL 58/nuclear data collections; NICKEL 60/nuclear data collections; NUCLEAR DATA COLLECTIONS/data covariances; CORRELATIONS; CROSS SECTIONS; EVALUATED DATA; GAMMA SPECTRA; NEUTRON SPECTRA; NEUTRONS; NUCLEAR MODELS; PHOTONS

16911 (INP–1671/PH) **Interactions of 10.6 GeV/n gold nuclei with light and heavy target nuclei in nuclear emulsion.** Cherry, M.L. (Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Physics and Astronomy); Denes-Jones, P.; dabrowska, A. KLMM. Institute of Nuclear Physics, Cracow (Poland). Mar 1994. 19p. Grant KBN 20379 91 01; Grant NSF

PHY-8907660; Grant PHY-9213621; Order Number DE95628994. Source: OSTI; NTIS; INIS.

We have investigated the particle production and fragmentation of nuclei participating in the interactions of 10.6 GeV/n gold nuclei in nuclear emulsions. A new criteria has been developed to distinguish between the interactions of these gold nuclei with the light (H, C, N, O) and heavy (Ag, Br) target nuclei in the emulsion. This has allowed separate analyzes of the multiplicity and pseudorapidity distributions of the singly charged particles emitted in Au-(H, C, N, O) and Au-(Ag, Br) interactions, as well as of the models of breakup of the projectile and target nuclei. The pseudorapidity distributions show strong forward asymmetries, particularly for the interactions with the light nuclei. Heavy target nuclei produce a more severe breakup of the projectile gold nucleus than do the lighter targets. A negative correlation between the number of fragments emitted from the target nuclei and the degree of centrality of the collisions has been observed, which can be attributed to the total destruction of the relatively light target nuclei by these very heavy projectile nuclei. (author). 14 refs, 11 figs, 1 tab.

16912 (JINR-E–2-94-412) **Probing the in-Medium Effect in Kaon-Nucleus Interaction.** Eliseev, S.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Hanna, K.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 12p. Order Number DE95627329. Source: OSTI; NTIS (US Sales Only); INIS.

The discrepancy between the experimental and the theoretical ratio R of the total cross sections, $R = \sigma(K^{+12}C)/6\sigma(K^{+}d)$, is intensively discussed. It is interpreted as a possible signal of partial deconfinement of the nucleons in nuclei in soft nuclear reactions at intermediate energies. More realistic predictions for nuclear in-medium effects were evaluated in the framework of Glauber multiple scattering theory. Results show that a more microscopical theory rather than the old optical model , on the one hand, is suitable for describing the interaction of K^--meson with carbon nucleus while, on the other hand, led to the disagreement with data for K^+-meson. This conclusion may be taken seriously into account as a new EMC-type effect. 26 refs., 3 figs.

16913 (JINR-E–2-94-424) **Analysis of Intermediate Energy Photonuclear Reactions.** Gabriel, T. (Oak Ridge National Lab., TN (United States)); Maino, G.; Mashnik, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 10p. Order Number DE95628274. Source: OSTI; NTIS (US Sales Only); INIS.

Talk presented at the 12-th International Seminar on High Energy Physics and Quantum Chromodynamics, Dubna, Russia, 12-17 Sep 1994.

The Cascade-Exciton Model (CEM) of nuclear reactions has been extended to describe photonuclear disintegration at intermediate energies. Using the CEM and the ORNL version of the Intranuclear Cascade Model for incident energies higher than the giant dipole resonance (GDR) region, and a group theory formalism based on the Interacting Boson Model in the GDR region, we have analyzed a variety of data for reactions induced by photons with energies up to $\approx$ 1.2 GeV and target-nuclei from ^{12}C to ^{243}Am. The contributions of different photon absorption mechanisms and the relative role of different particle production mechanisms in these reactions are discussed. 41 refs., 7 figs., 1 tab.

16914 (JINR-E–7-92-38) **On the problem of bound states of pions and neutrons.** Gudima, K.K. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki); Karnaukhov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 8p. Order Number DE95627307. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zeitschrift fur Physik.

The problem of existence of the bound states of negative pions and neutrons has been widely discussed for the last years. It is considered possibilities of the experimental observation of pion-neutron clusters, if they do exist, in nucleus-nucleus collisions. The yields of exotic fragments $\pi^{-Z}n^{A}$ in the interactions of ^{12}C and ^{56}Fe with ^{208}Pb at the energies from 0.3 to 3.7 GeV per nucleon are calculated. For ^{40}Ar+ ^{238}U and ^{139}La+ ^{238}U collisions the calculations were performed at the energied of 1.8 GeV and 1.3 GeV per nucleon, respectively. These calculations were performed in the framework of the coalescence mechanism with the differential cross sections for pion and neutron production generated by fire-streak model. The differential cross sections for production of $\pi^{-1}n^{-2}$, $\pi^{-2}N^{2}$, $\pi^{-}n^{4}$, $\pi^{-4}n^{6}$, and $\pi^{-12}n^{6}$ were calculated. It is shown that the use of very heavy projectiles like ^{56}Fe and ^{139}La has a great advantage in the experimental search for the exotic clusters. 20 refs.; 8 figs.

16915 (JINR-E–7-94-378) **Neutron-to-Total Width Ratios for Highly Excited Transcurium Compound Nuclei.** Andreev, A.N. (and others); Bogdanov, D.D.; Chepigin, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 7p. Order Number DE95627308. Source: OSTI; NTIS (US Sales Only); INIS.

The report presented at the workshop on Heavy Ion Fusion: Exploring the Variety of Nuclear Properties, Padova, Italy, May 25-27, 1994.

The production cross of the $^{252}102$ nuclide was measured in the $^{238}U(^{22}Ne, 8n)$-reaction by using the kinematical separator VASSILISSA and correlation technique. The obtained production cross section is compared to the ones for the (HI, 6n)-reactions leading to the same nuclide. The obtained $\langle\Gamma_n/\Gamma_{tot}\rangle$ values at the mean excitation energy 70 MeV were compared to the ones for neighbouring nuclides with the less Z and to the ones calculated from a statistical consideration. The dependencies of energy for the $\langle\Gamma_n/\Gamma_{tot}\rangle$ values are also obtained and discussed. 29 refs., 4 figs., 3 tabs.

16916 (JINR-E–7-94-381) **On the Time Scale of Multifragment Emission in ^4He + Au Collisions at E/A = 3.65 GeV/nucleon.** Shmakov, S.Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Avdeev, S.P.; Karnaukhov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 8p. Order Number DE95627301. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The relative angle distribution of coincident intermediate mass fragments has been studied for ^4He + Au collisions at 3.65 GeV/nucleon with the new 4π-setup FASA installed at the JINR synchrophasotron. Strong suppression of small relative angles is observed, which is attributed to the mutual Coulomb repulsion of emitted fragments. The multi-body Coulomb trajectory calculations are performed on the event-by-event basis, varying the decay lifetime of the fragmenting system as a parameter. The initial configurations for these calculations - fragment masses and charges, their start positions and velocities - are calculated with the statistical multifragmentation model. The charges, masses and excitation energies of the fragmenting nuclei are estimated within the intranuclear cascade approach. It is shown that the relative angle distribution of IMF's is very sensitive to the time scale of the multifragmentation process. The experimental data are well described assuming break-up of the system with less than 100 fm/c mean lifetime. 26 refs., 5 figs.

16917 (JINR-R–1-94-376) **Rapidity Distributions of π^- Mesons in (d, α, C)Ta Interactions at 4,2 GeV/c per Nucleon.** Bekmirzaev, R.N.; Kladnitskaya, E.N.; Muminov, M.M.; Sharipova, S.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 14p. (In Russian). Order Number DE95627302. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The dependences of π^- rapidity distributions on transverse momentum for dTa, αTa, CTa interactions at 4,2 GeV/c per nucleon are studied. The influence of the target atomic weight on π^- rapidity and transverse momentum distributions for CC and CTa interactions are investigated. The increase of the relative yield of π^- mesons with small p_t in CTa interactions as compared with CC ones was observed. The experimental results for CTa interactions are compared with the calculation according to the quark-gluon string model (QGSM). The model reproduces qualitatively the experimental distributions of the π^- mesons and well describes the p_t dependence of ratio of π^- yields up to p_t = 0,5 GeV/c for CTa and CC interactions. (author). 15 refs., 9 figs., 2 tabs.

16918 (JINR-R–4-94-427) **Calculation of the Angular Correlation Coefficient for Muon Captures on ^{28}Si with Modern Shell Model.** Boschitz, E. (Karlsruhe Univ. (T.H.) (Germany). Inst. fuer

Experimentelle Kernphysik); Kuz'min, V.A.; Ovchinnikova, A.A.; Tetereva, T.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 14p. (In Russian). Order Number DE95628276. Source: OSTI; NTIS (US Sales Only); INIS.

The independent amplitudes and angular correlation coefficients are calculated for the capture of polarised muons by ^{28}Si with the excitation of 1_3^+-state in ^{28}Al. The several sets of nuclear shell model Hamiltonian parameters are used. Theoretical models give the good correspondence between the results of calculation of the independent amplitudes ratio x, the asymmetry coefficient $\alpha^{(0)}$ and the residual polarization of the recoil nucleus β. The angular correlation coefficients for $1_3^+ \rightarrow 0_1^+$ γ-transition are defined only by x quantity. In that case the results of calculation coincide practically and can be used for experimental data analysis. The available experimental data indicate that the ratio g_P/g_A differs from the standard value. For $1_3^+ \rightarrow 2_1^+$ γ-transition the correlation coefficients depend on x and multipole mixing ratio δ. The considered shell model parameter sets give the different values for δ. The further investigation of nuclear structure or direct experimental definition of the δ are necessary to extract the g_P/g_A value from the experimental data about this transition. 15 refs., 4 figs., 1 tab.

16919 (JINR-R–9-92-125) **Time dependence of characteristics of electronuclear system.** Barashenkov, V.S.; Sosnin, A.N.; Shmakov, S.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 8p. (In Russian). Order Number DE95627294. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to At. Ehnerg.

The dynamics of electronuclear process created in a large nature-uranium target by a proton beam with energy 1 GeV simulated by means of Monte Carlo method. The fission of creating plutonium nuclei leads to a sharp rise in neutron density and, respectively, concentration of plutonium increases drastically too. For example, when current of accelerated protons equals 100 mA, the concentration of easy-fissile nuclei increases 4-5 times during first six months and is approximately doubled again during the next half-year. Because of increasing the neutron density in target periphery the leakage of neutrons rises hundreds times. During a year the heat yield on oncreases almost 50 times. At the same time the shape of space distribution of plutonium (the normalized distribution) is not changed. 3 refs.; 5 figs.; 1 tab.

16920 (LA-UR–95-834) **Deuteron and anti-deuteron production in CERN experiment NA44.** Simon-Gillo, J. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950173–2: Quark matter '95, Monterey, CA (United States), 9-13 Jan 1995). Order Number DE95009434. Source: OSTI; NTIS; INIS; GPO Dep.

The abundances of light nuclei probe the later stages of the evolution of a system formed in a relativistic heavy-ion collision. After the system has cooled and expanded, nucleons in close proximity and moving with small relative momenta coalesce to form nuclei. Light nuclei production enables the study of several topics, including the mechanism of composite particle production, freeze-out temperature, size of the interaction region, and entropy of the system. NA44 is the only relativistic heavy-ion experiment to have both deuteron and anti-deuteron results in both pA and AA collisions and the first CERN experiment to study the physics topics addressed by d and $\bar{d}$ production.

16921 (LA-UR–95-1020) **Recent results from NA44 and a review of HBT.** Jacak, B.V. Los Alamos National Lab., NM (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950127–1: 11. international conference on ultra-relativistic nucleus-nucleus collisions, Monterey, CA (United States), 9-13 Jan 1995). Order Number DE95009414. Source: OSTI; NTIS; INIS; GPO Dep.

High energy heavy ion collisions provide the opportunity to create hadronic matter at high energy density and study its properties. In order to do this, one must characterize the collisions, ascertain the size and density of the hot system in the central region of the nucleus-nucleus system, and determine the energy density achieved. Furthermore, one needs to determine whether or not the system approaches equilibrium so thermodynamic descriptions may be used. One of the experimental tools available is the study of two-particle correlations to map the space-time extent of the system when the hadrons decouple. Other observables include the flow of energy and charged particles transverse to the beam and the rapidity distribution of protons to indicate the amount of stopping and randomization of the incoming energy. The transverse mass distributions of hadrons reflect the temperature of the system at freezeout and effects of radial expansion. The production ratios of different particles are related to the extent of chemical equilibrium reached in the collision and subsequent evolution of the hadron gas. The NA44 Experiment at CERN can address all of these observables, though here the author focus mainly on correlation measurements. Kaons and pions are emitted rather late in the evolution of a heavy ion collision, at the time of "freezeout" when the hadrons cease to interact. Their correlations reflect the space-time evolution of the later part of the collision. In addition to characterizing the collision, correlations can signal a phase transition as they measure the duration of hadronization and particle emission, which should be long in both a first- or second-order phase transition. Furthermore, correlation measurements offer an important tool to help disentangle effects of expansion from the freezeout temperature reflected in the single particle spectra.

16922 (UCRL-ID–118720) **Benchmarking of multiple preequilibrium routines in GNASH.** Chadwick, M.B. (Lawrence Livermore National Lab., CA (United States). Nuclear Div.); Young, P.G. Lawrence Livermore National Lab., CA (United States). Aug 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010414. Source: OSTI; NTIS; INIS; GPO Dep.

The authors compare two different models for multiple preequilibrium emission (MPE) in GNASH: the older exciton MPE model; and a new generalized MPE model which is parameter-free. They analyze the proton-induced reactions on zirconium and lead, which were the focus of a recent NEA intermediate-energy code intercomparison, using both the MPE models. They find that the new generalized MPE model better describes the measurements.

16923 (UCRL-ID–118721) **Photonuclear reactions in the GNASH code: Benchmarking model calculations for reactions on lead up to 140 MeV.** Chadwick, M.B. (Lawrence Livermore National Lab., CA (United States)); Young, P.G. Lawrence Livermore National Lab., CA (United States). Aug 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010415. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have developed the GNASH code to include photonuclear reactions for incident energies up to 140 MeV. Photoabsorption is modeled through the giant resonance at the lower energies, and the quasideuteron mechanism at the higher energies, and the angular momentum coupling of the incident photon to the target is properly accounted for. After the initial interaction, primary and multiple preequilibrium emission of fast particles can occur before compound nucleus decay from the equilibrated compound nucleus. The angular distributions from compound nucleus decay are taken as isotropic, and those from preequilibrium emission (which they obtain from a phase-space model which conserves momentum) are forward-peaked. To test the new modeling they apply the code to calculate photonuclear reactions on ^{208}Pb for incident energies up to 140 MeV.

16924 (WAPD-T–3044) **Homogeneous critical Monte Carlo eigenvalue calculations with revised ENDF/B-VI data sets.** Kahler, A.C. Bettis Atomic Power Lab., West Mifflin, PA (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. (CONF-950601–9: Annual meeting of the American Nuclear Society, Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95009440. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. NEUTRON REACTIONS/monte carlo method; EIGENVALUES; NUCLEAR DATA COLLECTIONS; CROSS SECTIONS

6635 Nuclear Mass Ranges

Refer also to citation(s) 16837, 16858, 16873, 16874, 16875, 16879, 16880, 16881, 16882, 16885, 16888, 16889, 16915, 16916, 16917, 16919, 16922, 16923

6636 Radiation Physics

Refer also to citation(s) 16891, 16892, 16893, 17385

16925 (ENEA-RT-ERG-FUS–94-15) **Benchmark experiment on stainless steel bulk shielding at Frascati neutron generator.** Batistoni, P. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Angelone, M.; Martone, M.; Pillon, M.; Rado, V. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Nov 1994. 32p. (RT/ERG-FUS–94-15). Order Number DE95771033. Source: OSTI; NTIS (US Sales Only).

In the framework of the European Technology Program for NET/ITER, ENEA (Italian Agency for New Technologies, Energy and Environment) - Frascati and CEA (Commissariat a L'Energie Atomique) - Cadarache collaborated on a Bulk Shield Benchmark Experiment using the 14-MeV Frascati Neutron Generator (FNG). The aim of the experiment was to obtain accurate experimental data for improving the nuclear database and methods used in shielding designs, through a rigorous analysis of the results. The experiment consisted of the irradiation of a stainless steel block by 14-MeV neutrons. The neutron reaction rates at different depths inside the block were measured by fission chambers and activation foils characterized by different energy response ranges. The experimental results have been compared with numerical results calculated using both S_N and Monte Carlo transport codes and as transport cross section library the European Fusion File (EFF). In particular, the present report describes the experimental and numerical activity, including neutron measurements and Monte Carlo calculations, carried out by the (ENEA Italian Agency for New Technologies, Energy and Environment) team.

16926 (INIS-mf–14518) **Inter-element effects correction due to the secondary x-ray fluorescence in pixe analysis technic.** Tchantchane, A. (Centre de Developpement des Techniques Nucleaires, Lab. des Techniques Nucleaires, Algiers (Algeria)); Benamar, M.A.; Benouali, A.; Azbouche, A.; Tobbeche, S. No corporate text available. Jan 1995. 7p. (In French). Order Number DE95628304. Source: OSTI; NTIS (US Sales Only); INIS.

For accurate determination of analyte concentration, on must take into account the effect of proton energy decrease and as a consequence a change in ionization cross sections as rthe beam penetrates the sample. Further one must also correct for matrix effects. This phenomena is due to the attenuation of the emerging X-rays from a major elements by a minor element which ha sa high coefficient absorption for this radiation. We present in this paper the work related to the developpement of a computer pragram for the estimation of such correction. We show the importance of this correction as function of the proton incident energy and of the sample type and its composition.

16927 (INIS-mf–14529, pp. 21-22) **Calculation of gamma-ray spectra with given multiplicity.** Uhl, M. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GAMMA SPECTRA/capture; GAMMA SPECTRA/neutron reactions; GAMMA RADIATION; CAPTURE; GOLD 197; KERNFORSCHUNGSZENTRUM KARLSRUHE; KEV RANGE 100-1000; MONTE CARLO METHOD; MULTIPLICITY; NEUTRONS; RADIATION DETECTORS; STRENGTH FUNCTIONS

16928 (INIS-mf–14530, pp. 13) **Preparation of the measurement of double differential neutron-scattering cross sections at 14.1 MeV using the neutron generator of the IRK.** Priller, A.; Steier, P. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1991. In *Institute for Radiation Research and Nuclear Physics. Progress report 1991.* 46p. Order Number DE95627525. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRONS/cross sections; NEUTRONS/neutron generators; NEUTRONS/scattering; CALIFORNIUM 252; LEAD; MEV RANGE 10-100; NEUTRONS; SCATTERING; SODIUM; TIME-OF-FLIGHT METHOD

16929 (INP–1651/AP) **Methodology of measurement of thermal neutron time decay constant in Canberra 35+ MCA system.** Drozdowicz, K. (Institute of Nuclear Physics, Cracow (Poland)); Gabanska, B.; Igielski, A.; Krynicka, E.; Woznicka, U. Institute of Nuclear Physics, Cracow (Poland). 1993. 33p. Grant KBN 20199 91 01. Order Number DE95629005. Source: OSTI; NTIS; INIS.

A method of the thermal neutron time decay constant measurement in small bounded media is presented. A 14 MeV pulsed neutron generator is the neutron source. The system of recording of a die-away curve of thermal neutrons consists of a ^{3}He detector and of a multichannel time analyzer based on analyzer Canberra 35+ with multi scaler module MCS 7880 (microsecond range). Optimum parameters for the measuring system are considered. Experimental verification of a dead time of the instrumentation system is made and a count-loss correction is incorporated into the data treatment. An attention is paid to evaluate with a high accuracy the fundamental mode decay constant of the registered decaying curve. A new procedure of the determination of the decay constant by a multiple recording of the die-away curve is presented and results of test measurements are shown. (author). 11 refs, 12 figs, 4 tabs.

16930 (JINR-E–1-94-407) **Measurement of the Neutron Component in a Shower Generated in a Lead Target by Relativistic Nuclear Beam.** Chultehm, D.; Damdinsurehn, Ts.; D'yachenko, V.M.; Ehnkhzhin, L.; Lomova, L.A.; Perelygin, V.P.; Tolstov, K.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 27p. Order Number DE95627337. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods in Physics Research. Section A, Accelerators, Spectrometers, Detectors and Associated Equipment.

The present paper describes a method of determining the total number of neutrons generated in an extended lead target by relativistic nuclei and protons. It is shown that 101±20 neutrons per proton are produced in the target with the volume of 50x50x80 cm^3 at 3.65 GeV energy of protons. 11 refs., 14 figs., 1 tab.

16931 (JINR-E–3-94-128, pp. 11) **The ISIS liquid methane moderator.** Broome, T.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC MODERATORS/isis reactor; CRYOGENICS; METHANE; NEUTRON SOURCES; PERFORMANCE TESTING; SLOWING-DOWN

16932 (JINR-E–3-94-128, pp. 15) **The IBR-2 pulsed research reactor: status report.** Ananiev, V.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. IBR-2 REACTOR/nondestructive analysis; MATTER; NEUTRON FLUX; POWER RANGE 01-10 GW

16933 (JINR-E–3-94-128, pp. 19) **On some usual and unusual applications of the neutrons.** Somenkov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SOURCES/neutron diffraction; EARTH ATMOSPHERE; PULSED NEUTRON TECHNIQUES

16934 (JINR-E–3-94-128, pp. 31) **Small angle neutron researches at IBR-2: some results and perspectives.** Serdyk, I.N.

Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SPECTROMETERS/small angle scattering; IBR-2 REACTOR; STRUCTURAL CHEMICAL ANALYSIS

16935 (SAND–95-0155C) **Adjoint electron-photon transport Monte Carlo calculations with ITS.** Lorence, L.J. (Sandia National Labs., Albuquerque, NM (United States)); Kensek, R.P.; Halbleib, J.A.; Morel, J.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950716–1: 32. annual IEEE international nuclear and space radiation effects conference, Madison, WI (United States), 17-21 Jul 1995). Order Number DE95006814. Source: OSTI; NTIS; INIS; GPO Dep.

A general adjoint coupled electron-photon Monte Carlo code for solving the Boltzmann-Fokker-Planck equation has recently been created. It is a modified version of ITS 3.0, a coupled electronphoton Monte Carlo code that has world-wide distribution. The applicability of the new code to radiation-interaction problems of the type found in space environments is demonstrated.

16936 (UCRL-ID–118400) **Program EPICP: Electron photon interaction code, photon test module. Version 94.2.** Cullen, D.E. Lawrence Livermore National Lab., CA (United States). Sep 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009382. Source: OSTI; NTIS; GPO Dep.

The computer code EPICP performs Monte Carlo photon transport calculations in a simple one zone cylindrical detector. Results include deposition within the detector. transmission, reflection and lateral leakage from the detector, as well as events and energy deposition as a function of the depth into the detector. EPICP is part of the EPIC (Electron Photon Interaction Code) system. EPICP is designed to perform both normal transport calculations and diagnostic calculations involving only photons, with the objective of developing optimum algorithms for later use in EPIC. The EPIC system includes other modules that are designed to develop optimum algorithms for later use in EPIC; this includes electron and positron transport (EPICE), neutron transport (EPICN), charged particle transport (EPICC), geometry (EPICG), source sampling (EPICS). This is a modular system that once optimized can be linked together to consider a wide variety of particles, geometries, sources, etc. By design EPICP only considers photon transport. In particular it does not consider electron transport so that later EPICP and EPICE can be used to quantitatively evaluate the importance of electron transport when starting from photon sources. In this report I will merely mention where we expect the results to significantly differ from those obtained considering only photon transport from that obtained using coupled electron-photon transport.

16937 (UCRL-ID–119045) **Differencing the diffusion equation on unstructured meshes in 2-D.** Palmer, T.S. Lawrence Livermore National Lab., CA (United States). 24 Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95010410. Source: OSTI; NTIS; INIS; GPO Dep.

During the last few years, there has been an increased effort to devise robust transport differencings for unstructured meshes, specifically arbitrarily connected grids of polygons. Adams has investigated unstructured mesh discretization techniques for the even- and odd-parity forms of the transport equation, and for the more traditional first-order form. Conversely, development of unstructured mesh diffusion methods has been lacking. While Morel, Kershaw, Shestakov and others have done a great deal of work on diffusion schemes for logically-rectangular grids, to the author's knowledge there has been no work on discretizations of the diffusion equation on unstructured meshes of polygons. In this paper, the authors introduce a point-centered diffusion differencing for two-dimensional unstructured meshes. They have designed the method to have the following attractive properties: (1) the scheme is equivalent to the standard five-point point-centered scheme on an orthogonal mesh; (2) the method preserves the homogeneous linear solution; (3) the method gives second-order accuracy; (4) they have strict conservation within the control volume surrounding each point; and (5) the numerical solution converges to the exact result as the mesh is refined, regardless of the smoothness of the mesh. A potential disadvantage of the method is that the diffusion matrix is asymmetric, in general.

6640 Atomic and Molecular Physics

Refer also to citation(s) 16739

16938 (IAEA-NDS–156) **EADL: Evaluated Atomic Data Library of the Lawrence Livermore National Laboratory, USA. Summary documentation.** IAEA-NDS-Documentation series, IAEA-NDS-Documentation series. Lemmel, H.D. (ed.); Perkins, S.T.; Cullen, D.E.; Chen, M.H.; Hubbell, J.H.; Rathkopf, J.; Scofield, J. International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Sep 1994. 3p. Order Number DE95629009. Source: OSTI; NTIS (US Sales Only); INIS.

A brief summary documentation of the LLNL Evaluated Atomic Data Library EADL is given. The data library is available from the IAEA Nuclear Data Section on magnetic tape, costfree, upon request. (author).

6641 Theory of Electronic Structure of Atoms and Molecules

Refer also to citation(s) 16774

16939 (LRAP–167) **Large-scale atomic calculations using variational methods.** Joensson, Per. Lund Univ. (Sweden). Dept. of Physics. Jan 1995. 68p. Order Number DE95627345. Source: OSTI; NTIS; INIS.

Atomic properties, such as radiative lifetimes, hyperfine structures and isotope shift, have been studied both theoretically and experimentally. Computer programs which calculate these properties from multiconfiguration Hartree-Fock (MCHF) and configuration interaction (CI) wave functions have been developed and tested. To study relativistic effects, a program which calculates hyperfine structures from multiconfiguration Dirac-Fock (MCDF) wave functions has also been written. A new method of dealing with radial non-orthogonalities in transition matrix elements has been investigated. This method allows two separate orbital sets to be used for the initial and final states, respectively. It is shown that, once the usual orthogonality restrictions have been overcome, systematic MCHF calculations are able to predict oscillator strengths in light atoms with high accuracy. In connection with recent high-power laser experiments, time-dependent calculations of the atomic response to intense laser fields have been performed. Using the frozen-core approximation, where the atom is modeled as an active electron moving in the average field of the core electrons and the nucleus, the active electron has been propagated in time under the influence of the laser field. Radiative lifetimes and hyperfine structures of excited states in sodium and silver have been experimentally determined using time-resolved laser spectroscopy. By recording the fluorescence light decay following laser excitation in the vacuum ultraviolet spectral region, the radiative lifetimes and hyperfine structures of the $7p^2P$ states in silver have been measured. The delayed-coincidence technique has been used to make very accurate measurements of the radiative lifetimes and hyperfine structures of the lowest 2P states in sodium and silver. 77 refs, 2 figs, 14 tabs.

6642 Spectra of Atoms and Molecules and Their Interactions With Photons

16940 (IAEA-NDS–158) **EPDL: Evaluated Photon Data Library of the Lawrence Livermore National Laboratory, USA.** IAEA-NDS-Documentation series, IAEA-NDS-Documentation series. Lemmel, H.D. (ed.); Cullen, D.E.; Chen, M.H.; Hubbell, J.H.; Perkins, S.T.; Plechaty, E.F.; Rathkopf, J.A.; Scofield, J.H. International Atomic Energy Agency, Vienna (Austria). Nuclear Data

Section. Sep 1994. 4p. Order Number DE95629011. Source: OSTI; NTIS (US Sales Only); INIS.

A brief summary documentation of the LLNL Evaluated Photon-Interaction Data Library EPDL is given. The data library is available from the IAEA Nuclear Data Section on magnetic tape, costfree, upon request. (author).

16941 (UCRL-JC–118297) **Experiments with highly charged ions up to bare U^{92+} on the electron beam ion trap.** Beiersdorfer, P. Lawrence Livermore National Lab., CA (United States). Jul 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940707–1: 14. international conference on atomic physics, Boulder, CO (United States), 31 Jul - 5 aug 1994). Order Number DE95008827. Source: OSTI; NTIS; INIS; GPO Dep.

An overview is given of the current experimental effort to investigate the level structure of highly charged ions with the Livermore electron beam ion trap (EBIT) facility. The facility allows the production and study of virtually any ionization state of any element up to bare U^{92+}. Precision spectroscopic measurements have been performed for a range of $\Delta n = 0$ and $\Delta n = 1$ transitions. Examples involving 3-4 and 2-3 as well as 3-3 and 2-2 transitions in uranium ions are discussed that illustrated some of the measurement and analysis techniques employed. The measurements have allowed tests of calculations of the the quantum electrodynamical contributions to the transitions energies at the 0.4% level in a regime where $(Z\alpha) \approx 1$.

6643 Collision Phenomena

16942 (IBAMD–48) **International bulletin on atomic and molecular data for fusion. No. 48.** International Atomic Energy Agency, Vienna (Austria). Atomic and Molecular Data Unit. Oct 1994. 212p. Order Number DE95627357. Source: OSTI; NTIS (US Sales Only); INIS.

This bulletin provides atomic and molecular data references relevant to thermonuclear fusion research and technology. In part I the indexing of the papers is given separately for (i) structure and spectra (energy levels, wavelengths; transition probabilities, oscillator strengths; interatomic potentials), (ii) atomic and molecular collisions (photon collisions, electron collisions, heavy particle collisions), and (iii) surface interactions (sputtering, surface damage, blistering, flaking, arcing, chemical reactions). Part II contains the bibliographic data for the above listed topics and for plasma composition and impurities, plasma heating, cooling and fuelling, high energy laser- and beam- matter interaction, bibliographic and numerical data collections, and on interaction of atomic particles with fields. Also included are sections on atomic and molecular data needs for fusion research and on news about ALADDIN (A Labelled Atomic Data Interface) and evaluated-data bases.

16943 (IC–95/30) **Quantum versus semiclassical treatment of multiphonon effects in He atom scattering from surfaces.** Bilic, A. (Institute of Physics of the Univ., Zagreb (Croatia)); Gumhalter, B. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 48p. Order Number DE95628309. Source: OSTI; NTIS (US Sales Only); INIS.

We develop a formalism appropriate for studying multiple inelastic scattering of thermal energy. He atoms from surface phonons in the collision regimes in which both the motion of the particle and surface vibrations must be treated quantum-mechanically. Having in mind recent experiments on He atom scattering (HAS) from surfaces were first point out some difficulties connected with calculating the reflection coefficients under extreme multiphonon conditions by resorting to the standard T-matrix approach. To circumvent these problems we make use of the connection between the reflection coefficients and angular resolved scattering spectra and show how the latter can be conveniently obtained in the form of a cumulant expansion for multiphonon scattering amplitudes in powers of inelastic atom-surface coupling. In the scattering regimes in which the contributions of correlated multiphonon excitations become negligible relative to those of uncorrelated ones, the scattering spectrum acquired a particularly simple form of an exponentiated Born approximation (EBA). We find that under the conditions of these experiments the EBA can be considered as exact which enables accurate calculation of the corresponding multiphonon scattering spectra. The obtained results compare nicely with experimental data, confirming thereby the potentiality and applicability of the developed formalism in HAS. We also show that the semiclassical trajectory and fast collision or impulse approximations, which naturally derive as special limits of the EBA, can largely deviate from the so defined exact EBA treatment in the considered range of the parameter space. From this we conclude that they may become unreliable in the scattering regimes in which either the validity of the EBA is violated or their deviation from the EBA is large. 62 refs, 7 figs.

16944 (INIS-JP–028, pp. 15-17) **Cross sections of electron capture process of low energy ions.** Hamamoto, Nariaki (Kyoto Univ. (Japan). Faculty of Engineering); Tanaka, Takashi; Ogura, Masahiko; Itoh, Akio; Imanishi, Nobutsugu; Saito, Manabu; Haruyama, Yoichi. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Cross sections of electron capture process have been measured for carbon ions passing through several carbon-containing molecular gas targets at energies between 0.5 and 5 keV/amu. Multiple-electron transfer processes are predominate in these complex molecules. (author).

16945 (INIS-JP–028, pp. 18-20) **Production cross sections of recoiled Ar ions in charge changing collisions of carbon ions on Ar atoms.** Saito, Manabu (Kyoto Prefectural Univ. (Japan)); Haruyama, Yoichi; Hamamoto, Nariaki; Yoshida, Koji; Itoh, Akio; Imanishi, Nobutsugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Production cross sections of recoiled Ar ions have been measured in coincidence with charge-changed 2 MeV C^{q+} ions (q=2,3,4). The results indicate that the average charge of recoiled ions increases with increasing the number of captured or lost electrons of C^{q+} projectiles. Production cross sections of Ar^{i+} ions (i=1-6) can be fitted by independent-electron model (IEM), but measured cross sections for production of Ar^{7+} and Ar^{8+} ions were larger than fitted values by IEM. (author).

16946 (LA-UR–95-790) **Faddeev calculations of $p\mu$+p collisions: Effect of hyperfine splitting on the cross sections.** Hu, Chi-Yu (California State Univ., Long Beach, CA (United States). Dept. of Physics); Kvitsinsky, A.; Cohen, J.S. Los Alamos National Lab., NM (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950706–1: 19. international conference on the physics of electronic and the atomic collisions, Whistler (Canada), 26 Jul - 1 aug 1995). Order Number DE95007838. Source: OSTI; NTIS; INIS; GPO Dep.

The Faddeev equations, modified to remove long-range coupling between different channels, are solved in the total-angular-momentum representation for $p\mu$ + p collisions. S-wave elastic and hyperfine-transition cross sections are calculated with and without explicit inclusion of the hyperfine splitting ΔE. For hyperfine quenching the simpler approach without hyperfine splitting is found adequate at collision energies above about ΔE, but for elastic scattering it becomes adequate at somewhat higher energies. The present cross sections tend to fall in between earlier calculations done using a large Standard adiabatic expansion and those done using a two-state improved adiabatic expansion, but are closer to the former.

16947 (PNL-SA–24529) **Scaling of cross sections in ion-atom collisions.** DuBois, R.D. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941129–21: 13. international conference on the application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95008938. Source: OSTI; NTIS; INIS; GPO Dep.

Differential electron emission at 15° is investigated for 50-500 keV/amu hydrogen impacting on He and H targets. From hydrogen particles (H, H^+, H_2^+, H_3^+) ratios of cross sections relative to proton impact data, it is shown how bound projectile electrons influence the differential electron emission and where different ionization mechanisms are important. It is demonstrated that the H_2^+ and H_3^+ molecular ions interact as though they are composed of independent nuclei with the appropriate number of bound electrons, the electronic structure of the components appearing to be unimportant.

16948 (SINS–2151/1) **Systematic study of L-shell ionization of some heavy elements by light ion bombardment.** Braziewicz, J. (Wyzsza Szkola Pedagogiczna, Kielce (Poland)); Braziewicz, E.; Chojnacki, S.; Pajek, M.; Semaniak, J.; Czarnacki, W.; Czyzewski, T.; Glowacka, L.; Jaskola, M.; Kobzev, A.P.; Trautmann, D. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). Sep 1993. 40p. Order Number DE95629020. Source: OSTI; NTIS; INIS.

As a result of bombardment with ^1H, ^2H, ^3He and ^4He ions having energies of 0.6-4.0 MeV, 0.3-2.0 MeV, 0.6-3.0 MeV and 0.8-4.0 MeV, respectively, of heavy elements targets, i.e. Hf, Ta, W, Re, Os, Ir, Pt, Au, Bi, values of characteristic X-ray production cross sections for L_1, $L_{\alpha_{1,2}}$, $L_{\beta_{1,4,6}}$, $L_{\beta_{2,3,5,6}}$, $L_{\gamma_{4,4}}$ lines as well as L_1, L_2 and L_3 subshells ionizations cross sections have been measured. The experimentally determined ionization cross sections have been compared with predictions of theories describing Coulomb ionization process, namely by ECPSSR theory by Brandt and Lapicki and by semiclassical approximation theory. (author). 39 refs, 6 figs, 8 tabs.

16949 (UCRL-JC–118363) **Excitation mechanisms of $2s_{1/2}$-$2p_{3/2}$ and $2p_{1/2}$-$2p_{3/2}$ transitions in U^{82+} through U^{89+}.** Decaux, V.; Beiersdorfer, P.; Osterheld, A. Lawrence Livermore National Lab., CA (United States). 14 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940922–7: 7. international conference on physics of highly charged ions, Vienna (Austria), 19-23 Sep 1994). Order Number DE95010265. Source: OSTI; NTIS; INIS; GPO Dep.

A model based on detailed calculations of the electron-impact excitation of n = 2 electrons in the Li- to Ne-like uranium ions was developed to interpret and explain measurements on EBIT (Electron Beam Ion Trap). While only considering the direct excitation process provided a good model for the electric dipole (El) transitions, it was necessary for the magnetic dipole (MI) spectrum to include various additional excitation processes in the model. In particular, the model was expanded to include electron-impact excitation of n = 3 levels followed by radiative cascades. Moreover, excitation by the ionization of $2s_{1/2}$, $2p_{1/2}$, and $2p_{3/2}$ electrons and by radiative capture of beam electrons into excited levels was added. The new model demonstrates that the dipole-forbidden lines are almost exclusively produced by indirect excitation processes.

16950 (UCRL-JC–118364) **Wavelengths measurements of the He-like krypton K-shell spectrum.** Widmann, K.; Beiersdorfer, P.; Decaux, V. Lawrence Livermore National Lab., CA (United States). 13 Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940922–6: 7. international conference on physics of highly charged ions, Vienna (Austria), 19-23 Sep 1994). Order Number DE95010264. Source: OSTI; NTIS; INIS; GPO Dep.

We present accurate measurements of the 1s2s, ls2p → ls^2 transitions of He-like krypton. The measurements were performed on the EBIT facility using a high-resolution crystal spectrometer and a precision of 50 ppM was achieved. Unlike earlier measurements from the GANIL accelerator, our results are in good agreement with recent theoretical predictions.

6645 Special Atoms and Molecules

Refer also to citation(s) 16946

16951 (IC–95/33) **Evolution of the cellular communication system: An analysis in the Computational Paradigm.** Tahir Shah, K. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 10p. Order Number DE95628313. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the problem of the evolution of the cellular communication system from the RNA world to progenote to the modern cell. Our method analyses syntactical structure of molecular fossils in the non-coding regions of DNA within the information-processing gene model developed earlier. We concluded that sequence-specific binding is an ancient communication process with its origin in the RNA world. Moreover, we illustrate our viewpoint using four evolution snapshots from the first RNA segments, some 4.1. billion years ago, to the first cell, 3.8 billion years ago. (author). 31 refs.

16952 (JINR-E–1-94-423) **Experimental Estimation of the Lifetime of Atoms Formed by π^+ and π^- Mesons.** Afanas'ev, L.G. (and others); Gorchakov, O.E.; Chvyrov, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 6p. Order Number DE95628314. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

Based on observation of 272±49 atoms formed by π^+ and π^-mesons an estimation of the atom lifetime in the ground state is obtained: $\tau=(2.9_{-2.1}{}^{+\infty})\cdot10^{-15}$s or $\tau>0.6\cdot10^{-15}$s at 90% confidence level. Atoms were produced in inclusive pTa interactions at 70 GeV. 18 refs., 1 fig., 1 tab.

16953 (JINR-E–4-92-61) **Experimental estimates for muon transfer rates from excited pμ-atoms to ^{4}He nuclei.** Bystritskij, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Rak, J.; Kravtsov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 10p. Order Number DE95627375. Source: OSTI; NTIS (US Sales Only); INIS.

The data of the experiment with the mixture H_2+^{4}He are analyzed in order to estimate muon transfer rates from the excited states of pμ-atoms to helium. The rates for n=3,4,5 were found to be equal: $\lambda^{(3)}=(2+-7)10^{10}$ s^{-1}; $\lambda^{(4)}=(16+-13)10^{11}$ s^{-1}; $\lambda^{(5)}=(75+-60)10^{11}$ s^{-1}. The program for further investigations of the μ-atomic and μ-molecular processes in the mixture of hydrogen and helium isotopes is discussed. 25 refs.; 2 figs.; 1 tab.

16954 (JINR-E–4-92-140) **Muon transfer rates in hydrogen isotope mesic atom collisions.** Adamczak, A. (and others); Chiccoli, C.; Korobov, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 7p. Order Number DE95627374. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Lett., B.

The results of multi-level adiabatic calculations for the muon transfer rates in mesic atom ground states are presented for all hydrogen isotopes. The influence of the molecular structure and electron shell of hydrogen molecules on the processes has been taken into consideration. A comparison with previous theoretical data and experiments is reported. 25 refs.; 3 figs.; 4 tabs.

16955 (JINR-E–4-94-414) **Binding Energies and Nonradiative Decay Rates of Hedμ-Molecular Ions.** Belyaev, V.B.; Kartavtsev, O.I.; Kochkin, V.I.; Kolganova, E.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 11p. Order Number DE95628315. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review. A.

The method of hyperspherical 'surface' functions has been applied to the calculation of eigenvalues and eigenfunctions of muonic molecular ions ^{3,4}Hedμ. Binding energies and nonradiative decay rates for the states of the total angular momentum L=0,1,2 have been obtained. 14 refs., 1 tab.

16956 (LA-UR–95-728) **Progress towards antihydrogen production by the reaction of cold antiprotons with positronium atoms.** Charlton, M. (University Coll. London (United Kingdom). Dept. of Physics); Laricchia, G.; Deutch, B.I. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States);Human Capital and Mobility Fellowship;Carlsbergfondet, Copenhagen (Denmark);Statens Naturvidenskabelige Forskningsraad, Copenhagen

(Denmark);Royal Society, London (United Kingdom);Nuffield Foundation, Lon DOE Contract W-7405-ENG-36. Contract SCI-CT91-0694; Grant GR/K30827. (CONF-9409264–2: Low-energy antiproton physics, Bled (Slovenia), 12-17 Sep 1994). Order Number DE95007850. Source: OSTI; NTIS; INIS; GPO Dep.

An experiment aimed at producing antihydrogen atoms by the reaction of cold antiprotons stored in a Penning trap with injected ground state positronium atoms is described. The apparatus developed in an attempt to observe the charge conjugate reaction using proton projectiles is discussed. Technically feasible upgrades to this apparatus are identified which may allow, in conjunction with the PS200 trap, antihydrogen production at LEAR.

6650 Physics of Condensed Matter

Refer also to citation(s) 15846, 16757, 16773

16957 (BNL–61149, pp. 59-68) **Formation of voids in a liquid target due to charge deposition.** Amini, B. (CTI, Inc., Knoxville, TN (United States)); Nutt, R.; Patton, D.C.; Bida, G. Brookhaven National Lab., Upton, NY (United States). 1994. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

A new phenomenon which can occur in a liquid target as a result of charged particle (proton) irradiation is introduced. This phenomena is based on the fact that charge carriers in a liquid target are solely ions. Proton irradiation of a liquid target inherently causes positive charge deposition directly into the target material. To prevent charge buildup in the target material, the charge must be carried out by ions to the conducting walls. However, high collision rates of ions with background molecules impede charge transfer from the target material to the target walls. Localized positive charge buildup occurs allowing electrostatic pressure to overcome the gravitational pressure, leading to formation of voids. The electric field which is generated due to charge buildup can also cause a local breakdown of water molecules, and subsequently enhanced radiolysis. These and other phenomena which can occur due to charge buildup generally degrade the target yields, however, in some cases, they can contribute to increased heat transfer by conduction. Conditions for the formation of voids, enhanced radiolysis, and the required electric fields are also presented.

16958 (DOE/ET/53088–692) **Singular eigenfunctions for shearing fluids I.** Balmforth, N.J.; Morrison, P.J. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Feb 1995. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. Order Number DE95008952. Source: OSTI; NTIS; INIS; GPO Dep.

The authors construct singular eigenfunctions corresponding to the continuous spectrum of eigenvalues for shear flow in a channel. These modes are irregular as a result of a singularity in the eigenvalue problem at the critical layer of each mode. They consider flows with monotonic shear, so there is only a single critical layer for each mode. They then solve the initial-value problem to establish that these continuum modes, together with any discrete, growing/decaying pairs of modes, comprise a complete basis. They also view the problem within the framework of Hamiltonian theory. In that context, the singular solutions can be viewed as the kernel of an integral, canonical transformation that allows us to write the fluid system, an infinite-dimensional Hamiltonian system, in action-angle form. This yields an expression for the energy in terms of the continuum modes and provides a means for attaching a characteristic signature (sign) to the energy associate with each eigenfunction. They follow on to consider shear-flow stability within the Hamiltonian framework. Next, the authors show the equivalence of integral superpositions of the singular eigenfunctions with the solution derived with Laplace transform techniques. In the long-time limit, such superpositions have decaying integral averages across the channel, revealing phase mixing or continuum damping. Under some conditions, this decay is exponential and is then the fluid analogue of Landau damping. Finally, the authors discuss the energetics of continuum damping.

16959 (IC–95/42) **Monte Carlo simulation of the surface magnetic phase transition in chromium.** Mata, G.J. (International Centre for Theoretical Physics, Trieste (Italy)); Valera, M. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 12p. Order Number DE95628436. Source: OSTI; NTIS (US Sales Only); INIS.

Antiferromagnetic chromium is known to have a surface magnetic phase transition at a temperature T_s = 780K, which is well above its bulk Neel temperature, T_N = 311K. Electronic structure calculations predict an enhancement of the magnetic moment at the surface, due to changes in the local electronic environment. In order to ascertain the role of such an enhancement in the surface magnetic transition, we have modelled the surface by means of a classical Heisenberg model in which: (a) the magnitude of a given spin is equal to the value of the corresponding magnetic moment predicted by band structure calculations, (b) the exchange interaction J between spins is the same throughout the system, and (c) the exchange interaction is chosen so as to reproduce the bulk transition temperature. We find a ratio of surface to bulk transition temperature of T_S/T_N = 2.5, which is an excellent agreement with the experimental result. Our results suggest that the surface magnetic transition in chromium is driven by fluctuations in the orientation of the magnetic moments and that quantum fluctuations play a minor role. (author). 18 refs, 5 figs.

16960 (JINR-D–14-94-269(v.2), pp. 206-207) **Shybniko-de Haas effect in inversion layers on the grain boundary of $Hg_{1-x}Cd_xTe$ bicrystals under uniaxial compression.** Butko, N.B. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Fizicheskij Fakul'tet); Minina, N.Ya.; Savin, A.M.; Kraak, V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. CADMIUM ALLOYS/shubnikov-de haas effect; TELLURIDES/shubnikov-de haas effect; COMPRESSION; CRYSTAL LATTICES; ELECTRONS; ENERGY GAP; GRAIN BOUNDARIES; MAGNETORESISTANCE; MERCURY ALLOYS; TELLURIDES

16961 (JINR-D–14-94-269(v.2), pp. 250-251) **Surface electron fluctuations in metals and inelastic light scattering.** Klama, S. (AN SSSR, Moscow (Russian Federation). Inst. Teoreticheskoj Fiziki); Mishchenko, E.Zh.; Fal'kovskij, L.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. METALS/fluctuations; METALS/raman effect; ANISOTROPY; ELECTRONS; METALS; FLUCTUATIONS; PHONONS; PLASMONS; SURFACES

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Refer also to citation(s) 16147, 16354, 16409, 16761, 17048

16962 (ANL/ES/PP–79002) **NMR imaging and hydrodynamic analysis of neutrally buoyant non-Newtonian slurry flows.** Bouillard, J.X. (Argonne National Lab., IL (United States)); Sinton, S.W. Argonne National Lab., IL (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95005842. Source: OSTI; NTIS; GPO Dep.

The flow of solids loaded suspension in cylindrical pipes has been the object of intense experimental and theoretical investigations in recent years. These types of flows are of great interest in

chemical engineering because of their important use in many industrial manufacturing processes. Such flows are for example encountered in the manufacture of solid-rocket propellants, advanced ceramics, reinforced polymer composites, in heterogenous catalytic reactors, and in the pipeline transport of liquid-solids suspensions. In most cases, the suspension microstructure and the degree of solids dispersion greatly affect the final performance of the manufactured product. For example, solid propellant pellets need to be extremely-well dispersed in gel matrices for use as rocket engine solid fuels. The homogeneity of pellet dispersion is critical to allow good uniformity of the burn rate, which in turn affects the final mechanical performance of the engine. Today's manufacturing of such fuels uses continuous flow processes rather than batch processes. Unfortunately, the hydrodynamics of such flow processes is poorly understood and is difficult to assess because it requires the simultaneous measurements of liquid/solids phase velocities and volume fractions. Due to the recent development in pulsed Fourier Transform NMR imaging, NMR imaging is now becoming a powerful technique for the non intrusive investigation of multi-phase flows. This paper reports and exposes a state-of-the-art experimental and theoretical methodology that can be used to study such flows. The hydrodynamic model developed for this study is a two-phase flow shear thinning model with standard constitutive fluid/solids interphase drag and solids compaction stresses. this model shows good agreement with experimental data and the limitations of this model are discussed.

16963 (CONF-9410165–13) **Magnetic excitations in a random exchange system $Fe_xMn_{1-x}TiO_3$.** Kawano, H. (Tokyo Univ., Minato-ku, Tokyo (Japan). Inst. for Solid State Physics); Yoshizawa, H.; Nicklow, R.M.; Ito, A. Oak Ridge National Lab., TN (United States). 24 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Neutron scattering; Sendai (Japan); 11-14 Oct 1994. Order Number DE95006626. Source: OSTI; NTIS; INIS; GPO Dep.

In order to examine the influence of exchange frustration on spin wave excitations, inelastic neutron scattering experiments have been performed on a random exchange system $Fe_xMn_{1-x}TiO_3$ with x = 0.00, 0.10, 0.25 and 0.33. For all three mixed systems, the magnetic excitation spectra consist of two components: a well-defined spin wave component and a broad damped component. The latter can be well fitted to a spectral weight function for a damped harmonic oscillator.

16964 (INIS-JP–028, pp. 85-87) **Observations of hydrogen traps produced in nickel bombarded with helium-3, helium-4 and hydrogen ions.** Nakata, Hirokazu (Kyoto Univ. (Japan). Faculty of Engineering); Matsuoka, Kohtarou; Takagi, Ikuji; Fujita, Haruyuki; Higasi, Kunio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Experimental studies on radiation-induced traps of deuterium in nickel bombarded with He^3, He^4 and H_3 ions were conducted at elevated temperatures using the nuclear reaction $D(^3He, p)^4He$. The trapped deuterium concentration increased with the bombardment dose and decreasing the sample temperature. Depth profiles of the trapped deuterium showed peaks just corresponding to the mean projected ranges of the bombardment ions. The traps would be attributed to radiation-induced defects such as vacancies and interstitials. (author).

16965 (INIS-JP–028, pp. 91-93) **Study on initial stage of hetero-epitaxial growth by glancing angle scattering of fast ions from surfaces.** Fujii, Yoshikazu (Kyoto Univ. (Japan). Faculty of Engineering); Toba, Kazuaki; Narumi, Kazumasa; Kimura, Kenji; Mannami, Michihiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Initial stages of epitaxial growth of lead chalcogenides on the (100) surface of SnTe under UHV conditions are studied from the angular distribution of scattered ions at glancing angle incidence of 0.7 MeV He ions on the growing surfaces. Real time measurement of the angular distribution is performed during the growth. Anomalous broadening of the angular distribution is observed at the initial stage of the growth. The broadening is attributed to the surface wrinkles induced by a square network of misfit edge dislocations. (author).

16966 (INIS-JP–029, pp. 95-97) **In-situ study of layer-by-layer growth of PbSe(111) surface by specularly reflected ion spectroscopy.** Nakajima, Kaoru (Kyoto Univ. (Japan). Faculty of Engineering); Narumi, Kazumasa; Kimura, Kenji; Mannami, Michihiko; Fujii, Yoshikazu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

At glancing angle incidence of fast ions on a crystal surface, most of the ions are specularly reflected from the surface. Spectroscopy of the ions, which is called 'Specularly Reflected Ion Spectroscopy (SRIS)', can be utilized for study of surface characterization. We report in-situ study of homoepitaxial growth of PbSe(111) by SRIS with 500 keV H^+. (author).

16967 (INIS-JP–029, pp. 104-106) **RBS measurements of optical thin films.** Tukuda, Y. (Kyoto Univ. (Japan). Faculty of Engineering); Ektessabi, A.M. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Residual gases and impurities in the materials which are evaporated by electron beams are considered to be one of the reasons for creation of optical inhomogeneity. Therefore we adapted a new method for processing of the zirconia evaporation material using vacuum sintering method. The Zirconia thin films are prepared under various conditions. Our experimental results show that the gas from zirconia affects the amount of oxygen in the thin film and consequently the inhomogeneity in optical thin films. (author).

16968 (INIS-JP–029, pp. 113-115) **Epitaxial growth of Al/Al_2O_3 multilayer structures.** Ishida, M. (Kyoto Univ. (Japan). Faculty of Engineering); Hirai, N.; Takaoka, G.H.; Yamada, I. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

In order to obtain Al-Al_2O_3 quantum effect devices, it is necessary to deposit epitaxially Al on Al_2O_3 and Al_2O_3 on Al. We have already obtained an epitaxial Al/Al_2O_3/Al structures on Si(111). In this paper, we have deposit Al/Al_2O_3/Al structures on Si(111), and investigated the crystallinity by using RBS. (author).

16969 (INIS-JP–029, pp. 125-127) **Characterization of single crystalline semiconductors by RBS measurements.** Itoh, Akira (Kyoto Univ. (Japan). Faculty of Engineering); Kimoto, Tsunenobu; Yoshimoto, Masahiro; Matsunami, Hiroyuki. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

N^+ implantation-induced damage in SiC was characterized by RBS (Rutherford Backscattering Spectroscopy) measurements. The channeling measurements revealed that as-implanted layers had crystalline structure with heavy damage. The damage can be reduced by high-temperature annealing at 1500-1600degC. A low sheet resistance of 860Ω/□ was obtained by 1600degC annealing. However, the electrical activation was still low (26%), which may be caused by the defects remaining in the implanted layers. (author).

16970 (INIS-JP–029, pp. 128-129) **Imperfection of GaAs/Si layers studied by RBS, SR-SAXS and TEM.** Okuda, Hiroshi (Kyoto Univ. (Japan). Faculty of Engineering); Vezin, V.; Osamura, Kozo; Oku, Takeo. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

The structure of gallium arsenide grown on Si substrates have been investigated by means of RBS, SR-SAXS, and TEM. The origin of the streaks and diffuse isotropic scattering appearing in the small-angle scattering has been investigated by TEM. The RBS technique was used to examine the as-grown and annealed sample condition in terms of channeling yield and thickness distribution. It was found that the origin of the streaks are in the GaAs layer, and that of the diffuse scattering at the GaAs/Si interface. (author).

16971 (INIS-JP–029, pp. 130-131) **Positron lifetime study of vacancies and their clusters in Ti_3Al.** Murakami, Takashi (Kyoto Univ. (Japan). Faculty of Engineering); Ogawa, Noriko; Shirai, Yasuharu; Yamaguchi, Masaharu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Vacancies and their properties have been studied on electron and proton irradiated Ti_3Al by using positron annihilation lifetime spectroscopy. No constitutional vacancies have been detected in the material; all constitutional point defects are substitutional antisite atoms. The irradiated material starts to recover around 250K, which is ascribed to the migration of vacancies. Above 300K microvoids are formed due to the existence of hydrogen atoms. Irradiated Ti_3Al almost recovers to the fully annealed state below 650K. (author).

16972 (INIS-JP–029, pp. 132-133) **A positron lifetime study of radiation defects in proton-irradiated Si.** Uno, Yasutada (Kyoto Univ. (Japan). Faculty of Engineering); Shirai, Yasuharu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Radiation defects in proton-irradiated FZ-Si has been investigated by using positron lifetime spectroscopy. During the isochronal annealing, the positron lifetime of radiation defects stays almost constant up to about 520K. At about 520K these defects migrate and form secondary defects. This temperature corresponds to the formation of hydrogen-induced planer defect in silicon, whose microstructure has been studied by high-resolution electron microscopy. Present positron lifetime study indicates that this secondary defect contains vacancies. The positron lifetime at this planer defect is about 330ps and radiation induced defects are completely annealed at 940K. (author).

16973 (INIS-JP–029, pp. 134-135) **Diffusion barrier properties of W between Si and Cu.** Uekubo, Masaki (Kyoto Univ. (Japan). Faculty of Engineering); Nii, Kazushi; Oku, Takeo; Murakami, Masanori. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Cu can easily react with Si by heat treatment. In this experiment, a tungsten thin film was used as a diffusion barrier between Cu and Si. The diffusion depth profile from RBS spectrum gives the information about diffusing atoms. The W diffusion barrier, which has a thickness of 20nm, was stable at the annealing at 600degC. (author).

16974 (INIS-JP–034) **Activity report on neutron scattering research. V. 1, 1994.** Fujii, Y. (Tokyo Univ. (Japan). Inst. for Solid State Physics); Oohara, Y. (eds.). No corporate text available. Sep 1994. 176p. Order Number DE95768239. Source: OSTI; NTIS; INIS.

In April, 1993, the Neutron Scattering Laboratory attached to the Institute for Solid State Physics, University of Tokyo, was newly established in Tokai, Ibaraki Prefecture, to promote nationwide users' programs for utilizing the university-owned neutron instruments installed at the JRR-3M reactor of Japan Atomic Energy Research Institute. This upgraded reactor (20 MW, the cold source is installed) has drastically expanded the number of users and research areas since 1990 when it became operational. Currently 8 and 3 out of 18 new spectrometers in total at the JRR-3M are owned by ISSP and Tohoku University, respectively, while the remaining 7 spectrometers belong to JAERI. In addition, 3 conventional spectrometers in the 30 years old JRR-2 reactor (10 MW) have also supported research activities. This is the first issue of 'Activity report on neutron scattering research', and it is to be published annually. In this report, the brief history of neutron scattering research, the users' programs, the committees, the neutron scattering instruments available at the JRR-3M and the JRR-2M, the activity reports on structures and excitation, magnetism, superconductors, liquid and glass, material science, polymers, biology and instrumentation, and publication list are reported. (K.I.).

16975 (INIS-mf–14483, pp. 33-36) **Phase analysis by Moessbauer spectroscopy.** Sitek, J. (Slovenska Vysoka Skola Technicka, Bratislava (Slovakia). Elektrotechnicka Fakulta). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Slovak). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Moessbauer spectra of individual iron-containing phases have their characteristic parameters and they usually differ from each other. From the relative areas of the separate spectral lines it is possible to determine the relative atomic abundance of the nuclide to be measured. Moessbauer spectroscopy is thus a useful nondestructive method for qualitative as well as quantitative analysis of the phase being present in the sample. Phase analysis using Moessbauer spectroscopy has found a widespread use in many fields of science and technology. (author) 1 fig., 2 refs.

16976 (INIS-mf–14483, pp. 37-42) **Moessbauer spectroscopy in quasicrystals.** Miglierini, M. (Slovenska Vysoka Skola Technicka, Bratislava (Slovakia). Elektrotechnicka Fakulta). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Slovak). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

^{57}Fe transmission Moessbauer spectroscopy was applied to the study of icosahedral quasicrystals. Using three-dimensional projections of quadrupole splitting distributions, magnetic and structural properties were investigated. $Al_{40}Cu_{10}Ge_{25}Mn_{25}$ icosahedral quasicrystals which had been doped for the purpose of Moessbauer spectroscopy to 0.1, 0.3 and 3 at.% by probing Fe atoms, showed a magnetic transition at 30 K. A structural origin of the transition was excluded on the basis of results obtained from measurements on the $Al_{65}Cu_{20}Fe_{15}$ icosahedral quasicrystal made in the same temperature range. The latter was exposed to mechanical activation in a ball mill for up to 800 hours. In the course of mechanical grinding a structural transformation from the quasicrystalline to the amorphous state took place. (author) 4 figs., 15 refs.

16977 (INIS-mf–14483, pp. 117-123) **Pulsed and CW NMR study of drawn polypropylene fibres.** Sevcovic, L. (Technical University, Kosice (Slovakia). Department of Physics); Mucha, L.; Murin, J.; Terrajova, J. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Pulsed and broad-line proton NMR was used in investigation of both the molecular motions and the relaxations in oriented partially crystalline polypropylene (PP) fibres. Proton NMR measurements were made of the spin-lattice and rotating-frame relaxation times (T_1, T_{1r} resp.), spectra unfolding into elementary components and

the second moment of the spectra in the temperature range of 250-400 K for three kinds of drawn PP fibres. The fibres were made from isotactic PP marked as Tatren 430 produced by Slovnaft Bratislava. Relaxation time T_1 was measured by a multiple-pulse saturation recovery method. Rotating-frame data T_{1r} were obtained with radiofrequency field B_1=1.7 mT using the spin-locking method. The results of the experiments show that the differences in nuclear relaxation behavior are closely related to the structural changes (crystallinity and orientation) caused by the drawing process at different temperatures. (Z.S.) 4 figs., 10 refs.

16978 (JHP-Suppl–15, pp. 155-158) **In-beam Moessbauer spectroscopy on solid state physics.** Yoshida, Y. (Shizuoka Inst. of Science and Technology, Fukuroi (Japan)). Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. MOESSBAUER EFFECT/solid state physics; MOESSBAUER EFFECT/ion beams; ARGON 40 BEAMS; COULOMB EXCITATION; RECOILS; ION IMPLANTATION; VICKSI ACCELERATOR; IRON 57

16979 (JHP-Suppl–15, pp. 159-162) **Studies on microsynthesis of new compounds of iron.** Ambe, Fumitoshi (Institute of Physical and Chemical Research, Wako, Saitama (Japan)). Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. ION IMPLANTATION/iron compounds; ION IMPLANTATION/synthesis; MOESSBAUER EFFECT; SYNTHESIS; IRON 57; MANGANESE 57; RILAC; RECOILS; METALS; COULOMB EXCITATION

16980 (JHP-Suppl–15, pp. 202-205) **Hyperfine interaction of B light ion in Si Semiconductor, the position of implantation of B in silicon.** Izumikawa, Takuji (Osaka Univ., Toyonaka (Japan). Faculty of Science); Ohtsubo, Takashi; Fukuda, Shigekazu. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (In Japanese). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. BORON 12/silicon; BORON 12/hyperfine structure; ION IMPLANTATION; SILICON; NUCLEAR MAGNETIC RESONANCE; NUCLEAR QUADRUPOLE RESONANCE; CRYSTALS; INTERSTITIALS; ANGULAR DISTRIBUTION

16981 (JHP-Suppl–15, pp. 211-214) **Studies of hyperfine magnetic fields in transition metals by radioactive ion implantation.** Kawase, Yoichi (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.); Uehara, Shin-ichi; Nasu, Saburo; Ni Xinbo. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (In Japanese). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. TRANSITION ELEMENTS/ion implantation; TRANSITION ELEMENTS/radioactive ion beams; HYPERFINE STRUCTURE; CESIUM 140; PERTURBED ANGULAR CORRELATION; IRON; COBALT; NICKEL

16982 (JHP-Suppl–15, pp. 220-224) **New β-emitting probe ^{12}N (I^{π}=1$^+$, $T_{1/2}$=11 ms), for studying electric field gradient in solids and a measurement of its quadrupole moment.** Ohtsubo, T. (Osaka Univ., Toyonaka (Japan). Dept. of Physics); Fukuda, S.; Izumikawa, T. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

The quadrupole moment of the β-emitting short-lived nucleus ^{12}N (I^{π}=1$^+$, $T_{1/2}$=11 ms) was measured by use of a modified β-NMR (NNQR) method. The ^{12}N nucleus is the good probe nucleus for studying its hyperfine interactions in solids. Using the eqQ value of ^{12}N in BN and GaN and the q values measured by FT-NMR detecting of ^{14}N in the crystals, the quadrupole moment of ^{12}N(1$^+$) was determined. Using the Q value, the electric field gradients of ^{12}N in various metals are deduced from the observed eqQ values. For the case of magnesium metal q value is compared with the one predicted by the first-principle super-cell band structure calculation. The agreement between the experimental result and the theoretical one is fairly good. (author).

16983 (JHP-Suppl–15, pp. 225-228) **Real time measurement of the diffusion phenomena of inside and surface of the solid by short lived nuclide.** Komaki, Ken-ichiro (Tokyo Univ. (Japan). Coll. of Arts and Sciences); Yamazaki, Yasunori; Azuma, Toshiyuki. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (In Japanese). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. POSITRONS/diffusion: POSITRONS/gamma detection; POSITRONS; DIFFUSION; ANNIHILATION; SURFACES; IMPURITIES; SCINTILLATION COUNTERS; MEASURING INSTRUMENTS; SOLIDS; PHOTOELECTRON COUNTING

16984 (JHP-Suppl–15, pp. 229-231) **Moessbauer spectroscopy by short lived nuclide.** Nasu, Saburo (Osaka Univ., Toyonaka (Japan). Faculty of Engineering Science). Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (In Japanese). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. MOESSBAUER EFFECT/lifetime; MOESSBAUER EFFECT/radiation sources; LIFETIME; PLATINUM 197; GOLD 197; CRYSTAL LATTICES; NICKEL; IRON; HYPERFINE STRUCTURE

16985 (JHP-Suppl–15, pp. 232-236) **Structural optimization with KKR method and the electric field gradients of interstitial impurities in Mg.** Akai, H. (Nara Medical Univ., Kashihara (Japan)). Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Structural optimization based on the Korringa-Kohn-Rostoker band structure calculation is applied to Mg-N and Mg-Li super-cell structures simulating Mg based interstitial impurity systems. The resulting lattice relaxation of Mg atoms around the impurities turns out as big as 25-30%, which is bigger than the experimental indications. Calculated electric field gradients, combined with a recent NQR experimental result, on the other hand, yields the quadrupole moment of 12.7mb, being in a good agreement with other theoretical prediction. (author).

16986 (JHP-Suppl–15, pp. 241-242) **DYNASP: Dynamic nuclear self-polarization in InP and its implication for the study of compound semiconductors.** Nakamura, S. (Kyoto Univ., Uji (Japan). Inst. for Chemical Research); Ogawa, I.; Takimoto, T.; Matsuki, S.; Okano, K. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Short communication. INDIUM PHOSPHIDES/polarization; INDIUM PHOSPHIDES/magnetic fields; POLARIZATION; ORIENTED

NUCLEI; SEMICONDUCTOR MATERIALS; HYPERFINE STRUCTURE; INDIUM 115; NUCLEAR MAGNETIC RESONANCE; SPIN ORIENTATION

16987 (JINR-D–14-94-269(v.1), pp. 50) **Low-frequency excitations in Nd_2CuO_4 and Pr_2CuO_4 oxides.** Ivanov, A.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Bourges, P.; Petigrand, D.; Rossat-Mignod, J. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEODYMIUM OXIDES/excitation; NEODYMIUM OXIDES/spin waves; PRASEODYMIUM OXIDES/excitation; PRASEODYMIUM OXIDES/spin waves; ANTIFERROMAGNETIC MATERIALS; COPPER OXIDES; CRYSTAL FIELD; ENERGY GAP; ENERGY SPECTRA; EXCITATION; NEUTRON DIFFRACTION

16988 (JINR-E–3-94-128, pp. 20-21) **Neutron-aided investigations of condensed matter at pulsed sources.** Sadikov, I.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON DIFFRACTION/pulsed neutron techniques; MATTER; NEUTRON SOURCES; STRUCTURAL CHEMICAL ANALYSIS

16989 (JINR-E–3-94-128, pp. 22-23) **Neutron spectroscopy at the IBR-2 pulsed reactor.** Natkaniec, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON SPECTROSCOPY/neutron diffraction; NEUTRON SPECTROSCOPY/structural chemical analysis; IBR-2 REACTOR; LUMINOSITY; MEV RANGE 10-100; SPATIAL RESOLUTION; TIME-OF-FLIGHT METHOD

16990 (JINR-E–3-94-128, pp. 24-25) **A cold moderator at IBR-2 as the basis of the new possibilities in neutron scattering studies.** Mironova, G.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. (CONF-9406194–: PANS 2: advanced pulsed neutron sources, Dubna (Russian Federation), 14-16 Jun 1994). In *International Seminar on Advanced Pulsed Neutron Sources PANS-II. Invited talks.* 34p. Order Number DE95626739. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC MODERATORS/methane; ORGANIC MODERATORS/neutron diffraction; IBR-2 REACTOR; METHANE; SPATIAL RESOLUTION; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE RANGE 0013-0065 K

16991 (JINR-E–14-94-415) **Precision Fourier Neutron Diffraction Study of the High-Temperature Superconductor $Y(^{44}Ca)Ba_2Cu_4O_8$.** Balagurov, A.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Simkin, V.G.; Fischer, P.; Kaganovich, T.Yu.; Trunov, V.A.; Kaldis, E.; Karpinski, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 10p. Order Number DE95628442. Source: OSTI; NTIS (US Sales Only); INIS.

The high-temperature superconductor, $YBa_2Cu_4O_8$, with partial substitution of Ca for Y was investigated with a high-resolution Fourier neutron diffractometer over a wide temperature range. The ^{44}Ca isotope was used to increase neutron contrast. Structural analysis was performed for the spectra measured at 135, 165, and 293 K; the temperature dependence of the lattice parameters was determined from the points measured within the range of 8 to 288 K. The presence of a structural anomaly in the proximity of 150 K was confirmed. It manifests itself by a sharp change in the expansion coefficient along the b axis, irregular behaviour of the orthorhombicity coefficient, and a noticeable change in bond length. The most distinct change is a contraction of the distance between the Cu2 copper atom and the apical O1 oxygen, as well as change in the distance between the O2 and O3 atom chains in the CuO_2 layer. 8 refs., 4 figs., 3 tabs.

16992 (JINR-E–14-94-467) **Neutron Diffraction Study of the High-T_c Superconductor $HgBa_2CaCu_2O_{6.3}$ under High Pressure.** Aksenov, V.L. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics); Balagurov, A.M.; Savenko, B.N.; Antipov, E.V.; Putilin, S.N.; Capponi, J.J.; Glazkov, V.P.; Goncharenko, I.N.; Somenkov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 12p. Order Number DE95628443. Source: OSTI; NTIS (US Sales Only); INIS.

The pressure dependence of the crystal structure of a powder sample of $HgBa_2CaCu_2O_{6.3}$ (T_c=123 K) was studied in the pressure range of 0 to 3.6 GPa, using the DN-12 time-of-flight diffractometer at the IBR-2 pulsed reactor and a sapphire anvil cell chamber. At P=0 the results are in a good accordance with the published data. At P=3.0 and 3.6 GPa the best fit of the experimental data was achieved using the structural model with apical oxygen disordered in the (a,b) plane. The compressibility values of the lattice constants and selected bonds were calculated from the structural data. The highest absolute value of compressibility was found for the distance between the O atom layers. 12 refs., 6 figs., 3 tabs.

16993 (JINR-R–14-94-429) **Observation of Hysteresis at Spin-Flop Transition Induced by a Pulsed Magnetic Field.** Georgiev, D.; Nitts, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 14p. (In Russian). Order Number DE95628444. Source: OSTI; NTIS (US Sales Only); INIS.

The results of diffraction research of the spin-flop transitions in α-Fe_2O_3 and Cr_2O_3 performed on the SNIM-2 spectrometer of the IBR-2 pulsed reactor with the use of a pulsed magnetic field are presented. The field pulses had a sinusoidal form with a time duration of 400-1000 μs. The hysteresis dependences of the scattering intensity on the field value were obtained. In the case of hematite at amplitude changes of the magnetic pulses the hysteresis loop takes its utmost shape and width, which does not change with further increases in amplitude. The width of the utmost loop is almost one order less than the theoretical range of metastability of the phase states. At a decrease in temperature the width of the utmost loop decreases. In the case of Cr_2O_3 the hysteresis is observed at magnetic field amplitudes, which do not reach the critical value for phase transition. This testifies to a delay of the turning processor sublattice magnetization in the initial phase state. 11 refs., 12 figs.

16994 (JINR-R–14-94-430) **Weak Antiferromagnetism in $YFeO_3$ and $HoFeO_3$.** Georgiev, D.; Krezhov, K.; Nitts, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 4p. (In Russian). Order Number DE95628445. Source: OSTI; NTIS (US Sales Only); INIS.

Weak antiferromagnetism of Fe^{3+}-ions in $YFeO_3$ and $HoFeO_3$ by neutron diffraction at the SNIM-2 spectrometer using a pulse reactor IBR-2 is measured. The ratios between components of this antiferromagnetism and the main antiferromagnetic order are equal to 0.011 for $HoFeO_3$ (with precisions about 10%). 6 refs., 3 figs.

16995 (JINR-R–14-94-431) **Induced Antiferromagnetism in $HoFeO_3$.** Bujko, S.A.; Georgiev, D.; Krezhov, K.; Nitts, V.V.; Pasazhov, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 10p. (In Russian). Order Number DE95628446. Source: OSTI; NTIS (US Sales Only); INIS.

Results from neutron diffraction studies of single crystal $HoFeO_3$ in pulsed magnetic field by means of the spectrometer SNIM-2 of JINR (Dubna) are presented. The weak antiferromagnetism induced by the applied field in the Fe^{3+}- and Ho^{3+}-ions sublattices is measured in the temperature range 79-154 K. The temperature dependence of the antiferromagnetic susceptibility of the holmium

subsystem is derived and found to obey the Curie-Weiss law. 11 refs., 12 figs.

16996 (LNS–176) **Neutron scattering experiments on cuprates of the type $R_{1-x}Ce_xLaCuO_4$ (R=Pr, Nd; $0 \leq x \leq 0.2$).** Gutmann, M. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)). Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Neutronenstreuung. Mar 1995. 77p. (In German). Order Number DE95628447. Source: OSTI; NTIS; INIS.

Using a sol-gel-technique, samples of $Nd_{1-x}Ce_xLaCuO_4$ with $0 \leq x \leq 0.2$ have been synthesized with a weight of about 30 g each. In contrast to solid-state-reactions, the sol-gel-method should create a better homogeneity since the starting materials are mixed on a molecular scale. The purpose of the La is to introduce an internal chemical pressure to rise the critical temperature T-c since external pressure shows no effects in this direction. The tetravalent Ce^{4+} introduces electrons in the CuO_2-planes. Elastic neutron-scattering has been used to investigate the structural parameters. Since Ce has a smaller ionic radius than La and Nd (lanthanide-contraction) it is expected that the lattice parameters a and c of the tetragonal unit cell (space group I4/MMM) are decreasing functions of the Ce-concentration x. Surprisingly this behavior is only found for c. Using inelastic neutron-scattering the crystalline field of $R_{1-x}Ce_xLaCuO_4$ (R = Nd, Pr) has been investigated to obtain information on the local electronic structure in the CuO_2-planes. The compounds containing Nd (x = 0, 0.12) are non-superconducting and show indications towards orthorhombic distortions. The superconducting substances with Pr have been prepared by the Spanish group around X. Obradors and are gratefully placed to my disposal. The superconducting doping range is at least between $0.06 \leq x \leq 0.18$. The crystalline field of the two investigated samples (x=0.06, 0.12) clearly shows a substructure which can be interpreted in terms of different surroundings for Pr. (author) figs., tabs., 24 refs.

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Refer also to citation(s) 15048, 16057, 16058, 16060, 16109, 16114, 16759, 16943

16997 (BNL–61149, pp. 145-149) **Studies on the effect of window deformation on the scattering and energy profiles of the beam: Potential effects contributing to target mass.** Brookhaven National Lab., Upton, NY (United States). 1994. DOE Contract AC02-76CH00016. Grant NS-15380. (CONF-9309170–: 5. international workshop on targetry and target chemistry, Upton, NY (United States), 19-23 Sep 1993). In *Proceedings of the Fifth International Workshop on Targetry and Target Chemistry.* 392p. Order Number DE95006634. Source: OSTI; NTIS; GPO Dep.

Recently, the authors installed a preformed 18.5 miL thick aluminum window, possessing a 5 mm hemispherical deformation, onto a 77 mL volume conical target, but with the deformation placed concave into the target. This was done because pressure and beam induced deformation of our flat aluminum windows would cause them to bow outward beyond the helium cooling axis, which eventually resulted in window failure. It was thought that placing a preformed window in a concave geometry would provide additional radial strength to minimize further deformation, and also optimum window cooling thus increasing window lifetime. The windows were fabricated from 6061 aluminum alloy. The alloy exists in a T_6 state of hardness (the highest level), but can be converted to a T_0 workable state through heating of the alloy for several hours at 500°C. Once in this state, the windows can be deformed over a mandrel with little or no stress added to the surface structure. The alloy automatically reverts back to its original state of hardness over a 48 hour period. In-direct observations made on [^{11}C]cocaine specific activity suggested that target mass contributions were somewhat reduced with the window placed in a concave configuration. This has not been verified directly through CO_2 target mass measurements. Even so, this peaked interest in what effect window geometry might have on the scattering and energy profiles of the proton beam. These aspects could have significant effects on target surface contributions to mass.

16998 (CEA-CONF–11875) **Behaviour of thin films and bulk oxides under microbeam irradiation.** Trocellier, P. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Recherche sur l'Etat Condense, les Atomes et les Molecules. 1994. 2p. (CONF-941010–: 4. international conference on nuclear microprobe technology and applications, Shanghai (China), 10-14 Oct 1994). Order Number DE95627459. Source: OSTI; NTIS (US Sales Only); INIS.

Thin films of metal (gold, titanium and chromium) or binary compounds (hydrides and oxides) both with bulk oxides were submitted to various irradiation runs, using 900 keV to 2.5 MeV protons, deuterons and helium-4 microbeams (10 to 100 μm^2). μRBS, μPIXE and μNRA have been used to determine the surface composition of the irradiated samples versus ion nature and ion dose. The shrinking of thin metallic films within the irradiated area and the elemental transport to the neighbouring zones is clearly shown. The high resistance to irradiation effects of refractory oxides like Ta205 or W03 is also outlined. Moreover, the sputtering coefficients of transition metals have been experimentally measured. The comparison of these data with predicted values from classical models indicates that surface contamination effect may play an important role in the sputtering phenomenon. (author).

16999 (INIS-JP–028, pp. 9-11) **Angular dependence of the neutral fraction of medium-energy hydrogen emerging from $NiSi_2(111)$.** Ohdaira, Toshiyuki (Kyoto Univ. (Japan). Faculty of Engineering); Takashima, Atsushi; Koya, Tsuyoshi; Hatano, Kenjiro; Itoh, Akio; Imanishi, Nobutsugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

A strong angular dependence has been found first in the neutral fraction of medium-energy hydrogen emerging from $NiSi_2(111)$. The angular dependence can be explained well in terms of the atomic arrangement and composition of $NiSi_2(111)$ surface and impact-parameter (trajectory) dependent charge-exchange processes at a few atomic layers beneath the exit surface. (author).

17000 (INIS-JP–028, pp. 12-14) **Secondary ion emission bombarded with MeV heavy ion.** Takakuwa, Kei (Kyoto Univ. (Japan). Faculty of Engineering); Umezawa, Masumi; Kyoh, Sui-Gen; Itoh, Akio; Imanisi, Nobutugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

The intensity of secondary cluster ion emission from SiO_2 bombarded with MeV energy heavy ions has been measured. We examined the formation processes of secondary cluster ions by measuring the dependence of secondary ion yield on stopping power. The $Si_n O_m^+$ (m=2n-2, 2n-1, 2n), ions have the correlations with electronic-stopping power in the momentum transfer processes, respectively. (author).

17001 (INIS-JP–028, pp. 21-22) **Production of multiply charged Be ions by bombarding heavy projectiles.** Kyoh, Sui-Gen (Kyoto Univ. (Japan). Faculty of Engineering); Takakuwa, Kei; Bito, Yasunori; Itoh, Akio; Imanishi, Nobutsugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Production of multiply charged Be ions has been tried by bombarding heavy projectiles onto a solid beryllium target at a projectile energy range of MeV. (author).

17002 (INIS-JP–028, pp. 23-25) **Annealing behaviour of hydrogen in aluminium implanted silicon.** Yoshida, Hisashi (Kyoto Univ. (Japan). Faculty of Engineering); Nakatani, Norikazu; Ogura, Masahiko; Imanishi, Nobutsugu; Itoh, Akio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

An influence of silicon implantation on annealing behaviour of hydrogen in aluminium was studied. The temperature of a specimen was ramped upward at a rate of 1K/min. ERD was used to observe the depth profile of hydrogen. In the sample implanted silicon, hydrogen concentration in the near-surface region increased with increasing temperature. (author).

17003 (INIS-JP–028, pp. 94-96) **Charge-state distribution of MeV He ions scattered from the surface atoms.** Kimura, Kenji (Kyoto Univ. (Japan). Faculty of Engineering); Ohtsuka, Hisashi; Mannami, Michihiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University*. Order Number DE95709897. Source: OSTI; NTIS; INIS.

The charge-state distribution of 500-keV He ions scattered from a SnTe (001) surface has been investigated using a new technique of high-resolution high-energy ion scattering spectroscopy. The observed charge-state distribution of ions scattered from the topmost atomic layer coincides with that of ions scattered from the subsurface region and does not depend on the incident charge state but depends on the exit angle. The observed exit-angle dependence is explained by a model which includes the charge-exchange process with the valence electrons in the tail of the electron distribution at the surface. (author).

17004 (INIS-JP–028, pp. 97-99) **Dissociation of MeV HeH^+ ions at glancing angle incidence on a clean surface of single crystal.** Susuki, Yasufumi (Kyoto Univ. (Japan). Faculty of Engineering); Ito, Takashi; Kimura, Kenji; Mannami, Michihiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University*. Order Number DE95709897. Source: OSTI; NTIS; INIS.

Angular and energy distributions of scattered fragments have been measured at glancing angle incidence of MeV HeH^+ ions on a clean (001) surface of SnTe crystal. The distributions show that the internuclear vectors between fragments tend to align with the beam direction. The alignment is explained in terms of a surface wake potential due to dynamic response of surface electrons to the charges of fragments. In addition, internal energy released at dissociation of the ion is derived. The energy is approximately a half of the Coulomb potential energy of He^{2+} and H^+ at the ground state of molecular ion. (author).

17005 (INIS-JP–028, pp. 100-102) **High energy ion beam mixing.** Ektessabi, A.M. (Kyoto Univ. (Japan). Faculty of Engineering). Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University*. Order Number DE95709897. Source: OSTI; NTIS; INIS.

Experimental investigations have been made on the parameters which can be used to control the mixing profiles, and the width of intermixed layers in film-substrate systems being irradiated by high energy heavy ion beams. The samples were irradiated by ion beams of Au, Cu, and Si with energies of 1.5 to 3 MeV. Typical examples of the RBS spectra are presented and discussions are made on the extent of contribution of binary collisions on the interfacial mixing. The experimental and simulation results show that the interfacial mixing is dominated by the binary collisions. (author).

17006 (INIS-JP–028, pp. 106-108) **Epitaxial growth of Al films on sapphire substrates.** Akedo, K. (Kyoto Univ. (Japan). Faculty of Engineering); Hirai, N.; Takaoka, G.H.; Yamada, Isao. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University*. Order Number DE95709897. Source: OSTI; NTIS; INIS.

In order to obtain epitaxial Al-Al_2O_3 multi-layer devices, it is necessary to deposit epitaxially Al on Al_2O_3 and Al_2O_3 on Al. We have already obtained an epitaxial Al_2O_3 film on Al/Si (111). In this paper, we have grown Al films on sapphire (0001) substrates, and investigated the crystallinity by using RBS, RHEED, and X-ray diffraction measurements. (author).

17007 (INIS-JP–028, pp. 109-111) **Surface modification of bioactive ceramic by the Zr ion implantation.** Ishimoto, H. (Kyoto Univ. (Japan). Faculty of Engineering); Takaoka, G.H.; Swanson, M.; Yamada, Isao. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University*. Order Number DE95709897. Source: OSTI; NTIS; INIS.

Glass ceramics (A-W) were implanted with 200 keV Zr ions at doses of 1 x 10^{15} to 2.5 x 10^{15} ions/cm^2. The mechanical strength of Zr implanted ceramics was measured for the case of one-faced and four-faced implantation, and it was 140 - 200 MPa depending on the loading rate. Although the tensile strength has much influence on the critical value of the fracture strength, the A-W ceramics implanted on four faces showed higher fracture strength due to the prevention of the crack from proceeding than that on one faced implantation. (author).

17008 (INIS-JP–029, pp. 8-10) **Neutralization of intermediate-velocity Li emerging from Cs- and O-covered Si(100) surface.** Hadano, Ken-jiro (Kyoto Univ. (Japan). Faculty of Engineering); Ohdaira, Toshiyuki; Imai, Makoto; Itoh, Akio; Imanishi, Nobutsugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993*. Order Number DE95709896. Source: OSTI; NTIS; INIS.

Neutral fractions have been measured for intermediate-velocity ($v \approx 0.6\text{-}2v_0$, v_0: Bohr velocity 2.2x10^8 cm/s) Li emerging from Si(100) surface which Cs and O atoms were adsorbed to modify the electronic states of the surface. Contrary to the interpretation based on the resonant-neutralization model, the neutral fraction did not always correlate with the work function of the surface. The neutral fraction at low- ($v < v_0$) and high- ($v > v_0$) velocity region showed distinctly different behaviors. (author).

17009 (INIS-JP–029, pp. 11-13) **Current dependence of secondary-ion yield for SiO_2 bombarded with MeV heavy ions.** Umezawa, Masumi (Kyoto Univ. (Japan). Faculty of Engineering); Takakuwa, Kei; Imai, Makoto; Itoh, Akio; Imanishi, Nobutsugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993*. Order Number DE95709896. Source: OSTI; NTIS; INIS.

Secondary ion yields for SiO_2 target bombarded by 1.0-6.6 MeV Si^{q+} were measured as a function of incident-beam current (i_p) in a range 0.05-200pnA. Dependence of the yields on the stopping power was also obtained for some cluster ions. Secondary cluster ions are formed outside the target. (author).

17010 (INIS-JP–029, pp. 14-16) **Production of low energy beryllium ions utilizing a heavy ion sputtering ion source and its application to electron transfer collisions.** Horigami, H. (Kyoto Univ. (Japan). Faculty of Engineering); Bitoh, Y.; Awata, T.; Yoshida, K.; Imai, M.; Itoh, A.; Imanishi, N.; Saito, M.; Haruyama, Y. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993*. Order Number DE95709896. Source: OSTI; NTIS; INIS.

The First experimental studies have been performed on electron transfer collisions of low energy beryllium ions with various hydrocarbon molecules. To obtain sufficient beam intensity of beryllium ions, a Heavy-Ion-Sputtering-Ion-Source has been newly developed. Single and double electron capture cross sections have been successfully measured for Be^{q+} (q=1,2) ions in the energy range of (8-16)q keV. (author).

17011 (INIS-JP–029, pp. 20-22) **The annealing behaviour of hydrogen implanted into Al metal and Al-Si alloy.** Ogura, Masahiko (Kyoto Univ. (Japan). Faculty of Engineering); Nakatani, Norikazu; Sohda, Yuh-ichi; Imai, Makoto; Itoh, Akio; Imanishi, Nobutsugu. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993*. Order Number DE95709896. Source: OSTI; NTIS; INIS.

In the present experiment, we have investigated how defects and elements as additive play a role as trap site by observing the

annealing behaviour of hydrogen implanted into Al and Al-Si alloy. It was found that hydrogen is trapped as molecules in grain boundaries of Si in Al. (author).

17012 (INIS-JP–029, pp. 28-30) **Observation of lattice defect in semiconductors. Examination of the accuracy of minimum yield measurement in the channeling method. 2.** Kimura, Itsuro (Kyoto Univ. (Japan). Faculty of Engineering); Kanno, Ikuo; Kanazawa, Satoshi; Inbe, Takashi; Mikawa, Takumi; Ishihara, Shinji. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

To observe the neutron irradiation effect of silicon by the He^{2+} ion channeling method with Experimental System for Ion Beam Analysis. Kyoto University, its accuracy has been experimentally examined. And it has been shown that (1) considerably large change (10-20%) is observed for RBS yield at different rotation angles and (2) the He^{2+} beam current depend on the resistivity of target materials. (author).

17013 (INIS-JP–029, pp. 52-53) **Ion induced damage production and recovery in silicon.** Ito, H. (Kyoto Univ. (Japan). Faculty of Engineering); Shin, K.; Takagi, I.; Yoshida, K. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

We measured and analyzed defect production and recovery in single crystal silicon. Samples were bombarded by 800 keV O^+ ion with the dose from $2x10^{14}$ up to $2x10^{16}$ cm^{-2}. After irradiation we observed defects induced by ion bombardment by the channeling backscattering method. By the 30min annealing at 800degC of the sample, defects annihilated partly and some dislocations were formed in the crystal. We tried to estimate the quantity of them. (author).

17014 (INIS-JP–029, pp. 89-91) **Dissociative scattering of MeV HeH^+ ions at glancing angle incidence on a crystal surface.** Susuki, Yasufumi (Kyoto Univ. (Japan). Faculty of Engineering); Ito, Takashi; Kimura, Kenji; Mannami, Michi-hiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Energy spectra of specularly reflected fragments have been measured, when 0.8 - 2.5 MeV HeH^+ ions are incident on a clean (001) surface of SnTe crystal at glancing angles. The energy spectra show that the final energy released upon the dissociation of HeH^+ agrees well with that calculated from Coulomb repulsion between the He^+ and H^+ fragments in a free space, while most of the outgoing fragments are He^{2+} and H^+. The energy spectra of fragments are reproduced by a computer simulation. The cross section for dissociation of HeH^+ ions in collision with electrons at the surface is estimated to be of the order of 10^{-16} cm^2. (author).

17015 (INIS-JP–029, pp. 98-100) **Contribution of inner shell electrons to position-dependent stopping powers of a crystal surface.** Narumi, Kazumasa (Kyoto Univ. (Japan). Faculty of Engineering); Fujii, Yoshikazu; Kishine, Keiji; Kurakake, Hiroshi; Kimura, Kenji; Mannami, Michi-hiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Position-dependent stopping powers of the (001) surface of SnTe single crystal for specularly reflected 15 - 200 keV H^+ ions are studied. The position dependence of the experimental stopping powers varies with the energy of ions. From the comparison with the theoretical stopping powers based on both the single ion-electron collision and the collective excitation of the valence electrons, it is concluded that the observed change in the position-dependent stopping powers with energy of H^+ is due to the variation of contribution of inner shell electrons to stopping. (author).

17016 (INIS-JP–029, pp. 101-103) **Preparation of thin oxide films using ion beam mixing effect.** Ektessabi, A.M. (Kyoto Univ. (Japan). Faculty of Engineering). Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

In this paper, the experimental results of sputter deposition of thin oxide films of titanium and aluminum are presented and the effects of simultaneous irradiation of thin films during growth by an oxygen ion beam are discussed. The films are deposited on various substrates such as Ti, Si, SUS, and quartz using argon ion beam for sputtering, and oxygen ion beam for producing the mixing effect and control of the stoichiometry of the oxides. RBS Measurement results related to the micromorphology of the interface, and film composition are presented. Experimental results suggest that the ion mixing effect in the process of ion beam assisted sputter deposition strongly influences the adhesion, and stoichiometry of the films. (author).

17017 (INIS-JP–029, pp. 110-112) **Irradiation-effects of CO_2 cluster ion beams on solid surface.** Yamaguchi, T. (Kyoto Univ. (Japan). Faculty of Engineering); Toyoda, N.; Takaoka, G.H.; Yamada, I. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Gas-cluster ion beams can be applied to new surface modification techniques such as surface cleaning, low damage sputtering and shallow junction formation. The effects of energetic CO_2 cluster impacts on solid surface were studied for cluster energies of 10keV. Irradiation effects were studied by AFM and RBS. A very flat Pt/Si surface was obtained after irradiation with CO_2 clusters, which indicates lateral sputtering effect at the surface. CO_2 cluster ion irradiation on Cu/Si produced lower damage than CO_2 monomer ion irradiation. (author).

17018 (INIS-JP–029, pp. 116-118) **Surface modification of silica glasses for the radiotherapy by using phosphorus ion implantation.** Takaoka, G.H. (Kyoto Univ. (Japan). Faculty of Engineering); Yamada, Isao; Kawashita, Masaichi; Miyaji, Fumiaki; Kokubo, Tadashi. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

A pure silica glass was implanted with phosphorus ions by a dose of 2×10^{17} cm^{-2} at 20 kev, and subjected to heat-treatments up to 900 degC. They were soaked in distilled water at 95 degC for 7 days. The phosphorus ion was completely dissolved into the water from the as-implanted glass. The dissolution was, however, much suppressed by the heat-treatment of the glass. The RBS measurement showed that an appreciable amount of phosphorus remained in the glass heat-treated at 900 degC even after the soak in the hot water. These results indicate that the phosphorus implanted glass is a promising material for the radiotherapy. (author).

17019 (JHP-Suppl–15, pp. 215-219) **Hyperfine interactions of short-lived beta emitter ^{12}B implanted in ferromagnetic Co.** Yanagisawa, T. (Osaka Univ., Toyonaka (Japan). Dept. of Physics); Momota, S.; Tanaka, M.B. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jun 1994. (In Japanese). (CONF-9312103–: Symposium on the science of short-lived RI beam 1993, Tanashi (Japan), 16-18 Dec 1993). In *Proceeding of the symposium on the science of short-lived RI beam 1993.* 336p. Order Number DE95747917. Source: OSTI; NTIS; INIS.

Hyperfine interactions of short-lived β emitter ^{12}B implanted in hcp Co and single crystal bcc Co/Fe multilayers were investigated by use of the asymmetric β-decay and NMR detection. In hcp Co, three kinds of hyperfine fields were observed as $B_{hf}(S1)$=-4.3(1)kG, $B_{hf}(S2)$=-24.2(6)kG, and $B_{hf}(S3)$=-27.5(2)kG at 330K, and the spin-lattice relaxation time T_1 was studied at the three fields, respectively. It is estimated that the observed widths of the resonances were resulted from the atomic dipolar fields. In bcc Co/Fe multilayers, two kinds of internal fields were observed as B_{int}=-0.1(1)kG and B_{int}=+2.42(9)kG at 330K. It is indicated that the lower field was attributed to that in Fe, and the higher one was to bcc

Co. The spin-lattice relaxation time T_1 at the two respective fields were also studied. (author).

17020 (JINR-D–14-94-269(v.2), pp. 104-105) **Quasi-equilibrium relaxation in poorly-compensated impurity silicon conditioned by low-temperature recharging of impurities and defects.** Zykov, V.M. (Nauchno-Issledovatel'skij Inst. Introskopii, Moscow (Russian Federation)). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SILICON/photoconductivity; BORON ADDITIONS; CHARGE EXCHANGE; CRYSTAL DEFECTS; CRYSTAL DOPING; PHYSICAL RADIATION EFFECTS; RECOMBINATION; RELAXATION TIME; SILICON; PHOTOCONDUCTIVITY; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K

17021 (JINR-E–14-94-367) **Scanning Tunneling and Electronic Microscopy of Diamond Irradiated by High Energy Ions.** Didyk, A.Yu. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Varichenko, V.S.; Zajtsev, A.M.; Rusetskij, M.S.; Weldige, K. de; Fries, Th.; Wandelt, K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 10p. Order Number DE95627460. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the 17-th International Conference 'Nuclear Tracks in Solids', Dubna, 1994.

The surfaces of boron doped synthetic and natural diamonds have been investigated by scanning tunneling (STM) and electronic microscopy (SEM) before and after irradiation with ^{40} Ar (25 MeV), ^{84} Kr (210 MeV), ^{129} Xe (124 MeV) ions. The structures observed (STM) after irradiation showed craters ranging from 3 nm to 20 nm in diameters, which are deduced to be single ion tracks and multiple hits of ions at the nearest positions of the surface. In the case of argon ion irradiation the surface was very amorphous, but after xenon irradiation one could see parts of surface without amorphism. It can be explained by the influence of high inelastic energy losses. 20 refs., 5 figs.

17022 (NIFS-DATA–22) **Simulation calculations of physical sputtering and reflection coefficient of plasma-irradiated carbon surface.** Kawamura, T.; Ono, T.; Yamamura, Y. National Inst. for Fusion Science, Nagoya (Japan). Aug 1994. 16p. Order Number DE95768190. Source: OSTI; NTIS; INIS.

Physical sputtering yields from the carbon surface irradiated by the boundary plasma are obtained with the use of a Monte Carlo simulation code ACAT. The yields are calculated for many random initial energy and angle values of incident protons or deuterons with a Maxwellian velocity distribution, and then averaged. Here the temperature of the boundary plasma, the sheath potential and the angle δ between the magnetic field line and the surface normal are taken into account. A new fitting formula for an arrangement of the numerical data of sputtering yield is introduced, in which six fitting parameters are determined from the numerical results and listed. These results provide a way to estimate the erosion of carbon materials irradiated by boundary plasma. The particle reflection coefficients for deuterons and their neutrals from a carbon surface are also calculated by the same code and presented together with, for comparison, that for the case of monoenergetic normal incidence. (author).

6654 Quantum Physics Aspects of Condensed Matter

17023 (IC–95/40) **Breakdown of quasiparticle picture in the low-density limit of the 1D Hubbard model.** Qin Shaojin (Academia Sinica, Beijing, BJ (China). Inst. of Theoretical Physics); Qian Tiezheng; Su Zhaobin; Yu Lu. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 14p. Order Number DE95629161. Source: OSTI; NTIS (US Sales Only); INIS.

Using the finite-size scaling of results obtained by exact diagonalization, we study the low-density limit of the one-dimensional Hubbard model. Calculating the quasiparticle weight, we demonstrate that for a given particle number N and system size L, there always exists a crossover point U_c separating the Fermi-liquid ($U < U_c$) and non-Fermi-liquid ($U > U_c$) regimes (U is the Hubbard repulsion). We find that for a fixed N, U_c is inversely proportional to L, keeping U_cL/t constant (with t as the hopping integral), as L is large enough. It follows that in the low-density (in fact vanishing density) limit $L \to \infty$, $U_c \to 0$, so the system is always in non-Fermi-liquid regime as long as $U > 0$. We show that our numerical results are consistent with the Bethe ansatz solution. (author). 11 refs, 3 figs.

665410 Superconductivity

Refer also to citation(s) 15616, 16264, 16265, 16453

17024 (ANL/ET/CP–84477) **Performance evaluation of high-temperature superconducting current leads for micro-SMES systems.** Niemann, R.C. (Argonne National Lab., IL (United States)); Cha, Y.S.; Hull, J.R.; Buckles, W.E.; Weber, B.R.; Yang, S.T. Argonne National Lab., IL (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941013–32: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95005843. Source: OSTI; NTIS; GPO Dep.

As part of the U.S. Department of Energy's Superconductivity Technology Program, Argonne National Laboratory and Superconductivity, Inc., are developing high-temperature superconductor (HTS) current leads for application to micro-SMES systems. Two 1500-A HTS leads have been designed and constructed. A component performance evaluation program was conducted to confirm performance predictions and/or to qualify the design features for construction. The evaluations included HTS characteristics, demountable electrical connections, and heat intercept effectiveness. The performance of current lead assemblies is being evaluated in a zero-magnetic-field test program that included assembly procedures, tooling, and quality assurance; thermal and electrical performance; and flow and mechanical characteristics. The leads were installed in a liquid helium test cryostat and connected at their cold ends by a current jumper. The leads were heat intercepted with a cryocooler.

17025 (BNL–61242) **Effects of temperature ramp rate during heat treatment on hysteresis loss and critical current density of internal tin processed wires.** Suenaga, M.; Sabatini, R.L. Brookhaven National Lab., Upton, NY (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9503127–1: 9. US/Japan workshop on high-field superconducting materials, Kyoto (Japan), 11-16 Mar 1995). Order Number DE95009551. Source: OSTI; NTIS; INIS; GPO Dep.

It has been shown that temperature ramp rates utilized in heat treatment schedules for internal tin processed Nb_3Sn wires substantially influence both hysteresis loss and critical current density J_c of the wires, i.e. a slow ramp rate (e.g. 6°C/h) favors a higher J_c while a fast ramp (e.g. 60°C/h)results in a low hysteresis loss of the wire.

17026 (BNL–61337) **Properties of an orbital Kondo array.** Emery, V.J. (Brookhaven National Lab., Upton, NY (United States)); Kivelson, S.A. Brookhaven National Lab., Upton, NY (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC02-76CH00016. GRANT DMR-90-11803. (CONF-931247–11: Strongly correlated electronic materials, Los Alamos, NM (United States), 15-18 Dec 1993). Order Number DE95006775. Source: OSTI; NTIS; INIS; GPO Dep.

We consider a solvable model of a one dimensional electron gas interacting with an array of dynamical scattering centers, whose state is specified by a pseudospin variable. In the dilute limit, for frequencies w and temperatures T below the single-center Kondo scale but above a coherence scale δ, the physics is governed by the fixed point of the single-impurity two-channel Kondo problem. In that region, the physical properties are governed by composite (or odd-frequency) pairing fluctuations and they are reminiscent of

the normal state of high temperature superconductors. As ω and T $\rightarrow$ 0, three susceptibilities are equally divergent: (1) conventional, spin-singlet even-parity pairing (2) composite spin-singlet odd-parity 77-pairing and (3) odd parity pseudospin.

17027 (CONF-9407153–Vol.1, pp. 35-44) **Superconducting technology: The impact of oxide superconductors.** Blaugher, R.D. (National Renewable Energy Lab., Golden, CO (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The application of superconductors to a variety of power systems and electronic applications has been pursued over the past twenty years. High-field, high-current type II superconductors such as NbTi and Nb3Sn were successfully applied to a wide range of large-scale applications – from bubble chambers to levitated trains. The discovery of the Josephson junction and its associated fast switching behavior was applied to sensors, computer logic and a wide range of signal processing applications. It is fair to assume that all of these previous superconducting related applications were compromised by the necessity for liquid helium cooling. The discovery of the high-temperature oxide superconductors has renewed interest and buoyed the prospects for the superconducting technology. These expectations can only be realized if oxide based performance is achieved with mechanical and electrical characteristics which are functionally equivalent to the conventional superconductors. This talk will review the past and present status for the superconducting technology with emphasis on power system related applications. The major problems that must be addressed to successfully integrate these new oxide materials will be discussed. Finally the prospects for the superconducting technology using oxide superconductors will be summarized.

17028 (CONF-9407153–Vol.1, pp. 50-60) **History of HTS motor development at Reliance Electric.** Schiferl, R. (Reliance Electric Co., Cleveland, OH (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

A review of the High Temperature Superconducting (HTS) motor development program at Reliance Electric is presented. The project was initiated in 1987 by EPRI to investigate the use of high temperature superconducting materials in electric motors. Liquid nitrogen was proposed as the HTS winding coolant. The ultimate goal, motivation, motor type and HTS wire requirements as well as the program milestones are outlined. It was concluded that the HTS motor development has paralleled wire development; progress continues toward the goal of large horsepower HTS motors for commercial applications; the team is well on the way toward completing the design of a 125 hp, 1800 rpm motor with HTS coils cooled to 20 to 40 K; and the program is a vital step in the development of HTS motors.

17029 (CONF-9407153–Vol.1, pp. 61-74) **A 100 MVA generator utilizing high-temperature superconducting windings – design assessment and component development.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The design and component development of a 100 MVA generator using high temperature superconducting windings are reviewed. The worldwide potential superconducting generator market over the next 10 years is forecasted to be $20 to 30 billion. Task 1 of the generator development consists of the design, economic evaluation, and interactions with the grid. Task 2 of the program consists of improving BSCCO wire, use of alternate materials, and wire and coil fabrication. Tasks 1 and 2 of the program are outlined.

17030 (CONF-9407153–Vol.1, pp. 104-124) **Collaborative development of Tl(1223) open-system tape conductors.** Tkaczyk, J.E. (General Electric Corporate R&D, Schenectady, NY (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

Steps in the collaborative development of Tl(1223) open system tape conductors for superconducting magnets and generators are outlined. These steps are: refrigerated magnet applications, tape requirements, conductor development, critical current versus thickness, substrate comparison, process control and continuous processing, flow system, high Jc sample from flow reactor, pull through apparatus, rapid versus two-step process, transport mechanism, reduction anneals, wire development advances 1994, and milestones 94-95.

17031 (CONF-9407153–Vol.1, pp. 126-161) **HTS wire development at Intermagnetic General Corporation.** Haldar, P. (Intermagnetics General Corp., Latham, NY (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The HTS wire development program at Intermagnetics General Corporation is outlined. Technical achievements in the Bi-2223, Tl-1223 and Tl-based conductor program are summarized. Long lengths of Tl-based HTS tapes with uniform transport properties have been fabricated. Multifilament samples of Tl-based HTS tapes have been fabricated for the first time. Optimization of thermomechanical processing is ongoing and weak links is still a major problem in P-I-T tapes. Future work is summarized.

17032 (CONF-9407153–Vol.1, pp. 162-190) **Development of BSCCO-2212/Ag composite conductors.** Marken, K.R. (Oxford Instruments Inc., Carteret, NJ (United States)); Dai, W.; Hong, S. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The development of BSCCO-2212/Ag composite conductors is outlined. Topics discussed include: advantages of dip coating, BSCCO-2212 conductor configurations, powder-in-tube status, overview of OST CRADA's with DOE, heat treatment optimization studies, thermal analysis of powder and conductor, Ag alloy and composite development, and the reason Jc increases with longer length. It is concluded that steady advances are being made in understanding some problems for Jc, powder-in-tube processing, and in the dip coating process.

17033 (CONF-9407153–Vol.1, pp. 193-206) **Introduction to ANL's effort in HTSc wire development.** Balachandran, U. (Argonne National Lab., IL (United States)); Crabtree, G.W.; Dorris, S.E.; Ellingson, W.A.; Goretta, K.C.; Gray, K.E.; Kupperman, D.S.; Kampwirth, R.T.; Lanagan, M.T.; Maroni, V.A. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The objective of this work is to develop, in the shortest possible time, methods to fabricate and use reliable HTS conductors in commercial applications for generation, transmission, and storage of electrical energy. The multiyear, experimental program focuses on improvement of materials properties, development of fabrication methods, and design and testing of HTS components and systems, with emphasis placed on wire and coil production. Collaborations with industry and academia are integral to the effort.

17034 (CONF-9407153–Vol.1, pp. 239-270) **Development of Tl-1223 conductors for high-temperature, high-field applications.** Gray, K.E. (Argonne National Lab., IL (United States)); Miller, D.J.; Lanagan, M.T.; Kampwirth, R.T.; Hettinger, J.D.; Hu, J.G.; Dorris, S.E.; Kupperman, D.S.; Goretta, K.C. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The goal of this part of the Argonne program is to develop a useful conductor for high-temperature, high-field applications, with Tl-1223 being the most promising candidate at present. The rationale is the improved flux pinning properties of Tl-1223 at 77 K compared to Bi-2223, first shown by us, and, the potential for improved intergranular coupling, first demonstrated by General Electric. Our research progress to date indicates that good phase purity and grain alignment are necessary, but not sufficient to obtaining the highest J_c in Tl-1223: it also is necessary to avoid significant intergranular weak links, and processing in presence of a transient liquid phase seems to be a very effective way to do this. Our mission/objective is to identify synthesis and processing procedures which will overcome the intergranular weak link problem in Tl-1223. Our approach is to concentrate on finding and using transient-liquid phases at the crucial step in processing to assist in grain orientation and improved intergranular connectivity, while preserving reasonable phase purity. This program includes various powder-in-tube (PIT) configurations and thick (20-50 micron) coatings, and much of it involves research agreements with General Electric, Intermagnetics General, SUNY-Buffalo and the Thallium Working Group. We also evaluate and quantify weak-links using TEM and transport measurements.

17035 (CONF-9407153–Vol.1, pp. 271-291) **Relationships between microstructure and critical current: Reaction induced texture and magneto-optic measurements.** Maroni, V.A. (Argonne National Lab., IL (United States)); Merchant, N.; Luo, J.; Welp, U.; Crabtree, G.W. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. DOE Contract W-31109-ENG-38. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The relationship between microstructure and critical current of superconducting wires is outlined. The following topics are discussed: reaction induced texture and magneto-optic imaging of Bi-2223/Ag composite conductors. Technical accomplishments, future work, and EERE sponsored activities in the ANL Chemical Technology Division are outlined.

17036 (CONF-9407153–Vol.1, pp. 293-329) **Bulk conductor development: Characterization and fabrication.** Suenaga, M. (Brookhaven National Lab., Upton, NY (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The characterization and fabrication of bulk superconductors for the electric power industry are outlined. The following topics are discussed: practical conductor development for electric power systems using high-T_c oxides, industrial and university collaborators, characterization capabilities in superconducting properties, dc transport dissipation mechanisms, critical currents at elevated temperatures, critical current density, tensile strain versus critical currents, fabrication of Bi 2223/Ag conductors, and powders used in the study.

17037 (CONF-9407153–Vol.1, pp. 331-365) **HTS powder synthesis and wire sintering.** Peterson, D. (Los Alamos National Lab., NM (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

Successful processing of HTS wires that exhibit superconducting properties and lengths appropriate for applications requires thoroughly understanding and carefully controlling experimental parameters. Initial important processing considerations are the quality and nature of the powder used to produce the superconductor within the wire composite. Following fabrication of the wire, sintering conditions must be chosen based on a knowledge of the phase behavior of the associated materials. HTS wire studies with our industrial partners have involved Bi-2212, Bi-2223, and Tl-1223 based systems. The goals of this project's efforts in these collaborations have been directed towards: (1) Establishing procedures for HTS powder syntheses that produce superconductors with optimal properties; (2) Studying conditions for HTS wire sintering that produce high current densities appropriate for conductor applications. The Los Alamos project involves 6 staff, 3 technicians, and 4 postdoctoral students.

17038 (CONF-9407153–Vol.1, pp. 370-404) **Deformation processing of HTS wire.** Bingert, J. (Los Alamos National Lab., NM (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

Methods to understand, control, and optimize deformation processing of HTS wire are outlined. Topics discussed include: technical progress, deformation processing effects on HTS - core uniformity in composite tapes, effects of rolling on tapes, deformation process modeling, channel die powder compaction stress-strain data, microhardness versus rolling reduction, minimum bifurcation strain versus material state, roll gap geometries for large versus small rolls, interactions, hydrostatic extrusion, and tensile properties.

17039 (CONF-9407153–Vol.1, pp. 405-440) **Critical currents and characterization of HTS conductors.** Maley, M. (Los Alamos National Lab., NM (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

At present the performance of HTS conductors is limited by a variety of material and physical problems that must be overcome in order for the full potential of HTS-based technology to be realized. The impressive advances in achieving high critical current densities, J_c's, in BSCCO conductors that can be manufactured in long continuous lengths have come from significant reduction of weak intergranular connections through improved control of microstructure. The rapid decline in J_c with magnetic field at temperatures above 25K has been associated with weak pinning of vortices related to the extreme intrinsic anisotropy of the BSCCO compounds. The objectives of this project are: (1) To investigate the transport and magnetic properties of HTS conductors to provide an understanding of the mechanisms that limit current flow in these materials at high temperatures in magnetic fields of technical interest; (2) To suggest and evaluate new methods of improving intergranular connectivity and flux pinning; and (3) To develop new experimental capabilities to provide a better characterization of the performance of HTS conductors and devices.

17040 (CONF-9407153–Vol.1, pp. 482-516) **Spray pyrolysis and thermal processing.** Parilla, P.A. (National Renewable Energy Lab., Golden, CO (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

Spray pyrolysis and thermal processing of superconducting wire are outlined. Topics discussed include: spray pyrolysis, 2-zone processing, PBSCCO precursor on $LaAlO_3$, GE verification study, verification results, physical properties of lattice - matched metal oxide materials, and thick film processing, future plans, major results, and program plans for FY95 are summarized.

17041 (CONF-9407153–Vol.1, pp. 518-570) **Critical currents and microstructure.** Kroeger, D.M. (Oak Ridge National Lab., TN (United States)); Christen, D.K. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

This is a comprehensive and highly collaborative project to determine and control the microstructural characteristics which lead to high critical current densities ($J_c(H)$) in polycrystalline conductors. Issues related to minimization of weak link behavior, optimization of flux pinning, and power dissipation in the resistive state above J_c are addressed. The specific objectives are: (1) to improve the effectiveness of processing for increasing $J_c(H)$ by (a) defining the paths through which long-range conduction occurs in high J_c polycrystalline conductors and prototype samples, and (b) developing methods and criteria by which to evaluate microstructures for use in conductor processing studies; (2) to increase and optimize the flux pinning by the controlled introduction of defect structures and by post-formation thermal processing; and (3) to determine the characteristics of various conductor forms for potential operation in the dissipative state above the critical current. All parts of this project are carried out in close collaboration with an industrial partner. Specimens examined are provided by industry and are drawn from current wire development programs.

17042 (CONF-9407153–Vol.1, pp. 571-608) **Thallium conductor development.** Goyal, A. (Oak Ridge National Lab., TN (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

This is a comprehensive and highly collaborative project aimed at conducting processing studies with the objective of fabricating Tl-1223 powder-in-tube (PIT) conductors as well as thick film wires with superior properties. The specific objectives are to: (1) determine aerosol process parameters and post heat-treatment conditions for forming anisotropic particles with varying phase assemblages; (2) optimize the initial deformation sequence and subsequent heat-treatment/deformation cycles to obtain well-linked PIT Tl-1223 wires; (3) conduct microstructural examination of quenched Tl-1223 thick films (supplied by GE) from various stages into the two-zone thallination procedure to determine the phase evolution and development of the colony microstructure during thallination and to determine the effects of various processing parameters on microstructure. Such a study will be useful in minimizing the thallination time, as needed for a continuous, pull-through process for making wire; and (4) fabricate Tl-1223 thick films on compatible ceramic as well as metallic substrates by a variety of techniques including: (a) spray pyrolysis, (b) painting an ink of aerosol-derived powder with an organic vehicle, and (c) sol gel.

17043 (CONF-9407153–Vol.1, pp. 609-650) **Thermomechanical processing of BSCCO conductors.** Kroeger, D.M. (Oak Ridge National Lab., TN (United States)); Sikka, V.K. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The ORNL BSCCO conductor development program involves collaborations with four companies and one university. The objectives of the industrial collaborations are to: (a) to determine fabrication routes for powder-in-tube (PIT) conductor which optimize the dimensional stability of the core, the Ag/superconductor interface and texture, (b) to determine mechanical properties of individual phases present during PIT fabrication, and (c) to contribute to the ASC initiative to develop processes for use of very fine and homogeneous powders in multifilament conductors; develop chemical barrier layers for strong metal substrates for Bi-2212 conductors; develop chemically compatible strengthened substrates for use in Bi-2212 conductors fabricated by dip-coating, and to aid in determining sources of J_c variability in wires prepared by Oxford; and develop thermal and mechanical processes for a continuous tubular wire fabrication method as an alternative to PIT. ORNL provides partial support for a student at the University of Wisconsin to evaluate the effects of dopants on aerosol powders for wires.

17044 (CONF-9407153–Vol.1, pp. 652-670) **Material synthesis and processing in the Tl-1223 system.** Voigt, J. (Sandia National Labs., Albuquerque, NM (United States)); Venturini, E.L.; Roth, E.P.; Aselage, T.L.; Lockwood, S.J. USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

Materials synthesis and processing in the Tl-1223 system are outlined. Topics discussed include: role of materials development in collaborations, effect of stoichiometry in the TL-1223 system, stoichiometries investigated, Ba-free composition has no melt events below 960°C, kinetics of Tl-1223 formation, liquid forming reactions, and nucleation and growth of Tl-1223. Conclusions and future work are summarized.

17045 (CONF-9407153–Vol.1, pp. 671-681) **Development and processing of Tl1223 wires and tapes.** Roth, P. (Sandia National Labs., Albuquerque, NM (United States)). USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). 29 Jul 1994. From Superconductivity program for electric power systems; Alexandria, VA (United States); 19-20 Jul 1994. In *Superconductivity Program for electric power systems: 1994 annual PEER review.* 690p. Order Number DE95005058. Source: OSTI; NTIS; GPO Dep.

The development and processing of Tl-1223 wires and tapes are outlined. The following topics are discussed: thermal processing optimization (solid phase); compositional designed matrix; rapid thermal processing; effects of carbon impurity; and extrusion methods and x-ray image analysis.

17046 (JINR-D–14-94-269(v.1), pp. 1-2) **Features of Andreev reflection in superconductor-semiconductor-superconductor structures.** Abens, S. (Wuerzburg Univ., Physikalisches Inst. (Germany)); Kuhlmann, M.; Zimmermann, U.; Keck, K.; Dikin, D.A.; Dmitriev, V.M.; Churilov, G.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. SUPERCONDUCTING JUNCTIONS/charge transport; SUPERCONDUCTING JUNCTIONS/multiple scattering; ELECTRIC CONDUCTIVITY; ELECTROMAGNETIC TESTING; ENERGY GAP; HETEROJUNCTIONS; INDIUM ANTIMONIDES; LEAD; MATHEMATICAL MODELS; SEMICONDUCTOR MATERIALS; SUPERCONDUCTORS; TIN

17047 (JINR-D–14-94-269(v.1), pp. 5-6) **Low-frequency plasma oscillations in the phase slip centers.** Agafonov, A.B. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Dikin, D.A.; Dmitriev, V.M.; Churilov, G.E. Rossijskaya Akaoemiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on*

low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC. Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 1 fig. SUPERCONDUCTORS/phase oscillations; SUPERCONDUCTORS/plasma waves; AMPLITUDES; FREQUENCY DEPENDENCE; JOSEPHSON EFFECT; OSCILLATION MODES; SHORT WAVE RADIATION; SUPERCONDUCTORS

17048 (JINR-D–14-94-269(v.1), pp. 8-9) **Investigation of the behaviour of superconducting Nb in a magnetic field by the polarized neutron transmission technique.** Aksenov, V.L.; Dokukin, E.B.; Kozhevnikov, S.V.; Nikitenko, Yu.V.; Petrenko, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs., 1 fig. NIOBIUM/radiation scattering analysis; NIOBIUM/superconductivity; ABRIKOSOV THEORY; CRITICAL FIELD; NEUTRON BEAMS; NIOBIUM; SUPERCONDUCTIVITY; POLARIZED BEAMS; SPIN ORIENTATION; TRANSMISSION; TYPE-II SUPERCONDUCTORS

17049 (JINR-D–14-94-269(v.1), pp. 18) **Magnetic properties of laminated superconductors with nodes in the excitation spectrum.** Aristov, D.N. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki); Maleev, S.V.; Yashenkin, A.G. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HIGH-TC SUPERCONDUCTORS/magnetic properties; HIGH-TC SUPERCONDUCTORS/relaxation time; BARIUM OXIDES; CERAMICS; COPPER OXIDES; ELECTRON-PHONON COUPLING; EXCITATION; FERMI LEVEL; TEMPERATURE DEPENDENCE; YTTRIUM OXIDES

17050 (JINR-D–14-94-269(v.1), pp. 32) **Model of topological generator (TG) on high-temperature superconductors.** Baurov, Yu.A.; Merkulova, S.P.; Seregin, B.M.; Antonov, Yu.F.; Ermolov, S.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING GENERATORS/high-tc superconductors; DIRECT CURRENT; MAGNETIC TESTING; SCALE MODELS; SUPERCONDUCTING FILMS

17051 (JINR-D–14-94-269(v.1), pp. 33) **Thin superconducting YBaCuO in strong microwave field.** Bakhanova, E.S. (AN SSSR, Gorki (Russian Federation). Inst. Prikladnoj Fiziki); Genkin, G.M.; Leviev, G.I.; Ovchinnikova, L.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/microwave radiation; SUPERCONDUCTING FILMS/response functions; AMPLITUDES; BARIUM OXIDES; COPPER OXIDES; HARMONICS; HIGH-TC SUPERCONDUCTORS; NONLINEAR PROBLEMS; PERFORMANCE TESTING; YTTRIUM OXIDES

17052 (JINR-D–14-94-269(v.1), pp. 34-35) **Paramagnetic centers with the singlet ground state in planes CuO_2:NMR of Tm-169 in superconductor $TmBa_2Cu_3O_{6+x}$.** Bakharev, O.N. (Kazanskij Gosudarstvennyj Univ., Kazan (Russian Federation). Biologicheskij Inst.); Teplov, M.A.; Brom, Kh.B.; Vittiven, Yu. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 2 figs. SUPERCONDUCTORS/paramagnetism; SUPERCONDUCTORS/spin-lattice relaxation; ANNEALING; BARIUM OXIDES; COPPER OXIDES; CRYSTAL DEFECTS; NUCLEAR MAGNETIC RESONANCE; SPECIFIC HEAT; SUPERCONDUCTORS; PARAMAGNETISM; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; THULIUM OXIDES; THULIUM 169

17053 (JINR-D–14-94-269(v.1), pp. 46-47) **Variation wave function in Hubbard model.** Borisyuk, V.A. (Krasnoyarskij Gosudarstvennyj Univ., Krasnoyarsk (Russian Federation)). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HIGH-TC SUPERCONDUCTORS/wave functions; HAMILTONIANS; SUPERCONDUCTIVITY; VARIATIONS

17054 (JINR-D–14-94-269(v.1), pp. 51-52) **Polaron conductivity YBaCuO in dielectric phase.** Varyukhin, S.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Parfenov, O.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/dielectric materials; HIGH-TC SUPERCONDUCTORS/polarons; BARIUM OXIDES; COPPER OXIDES; POLARONS; POLYCRYSTALS; SUPERCONDUCTIVITY; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

17055 (JINR-D–14-94-269(v.1), pp. 68-69) **Nonlocal model of the critical state of hard superconductivity.** Voloshin, I.F. (Vsesoyuznyj Ehlektrotekhnicheskij Inst., Moscow (Russian Federation)); Fisher, L.M.; Gorbachev, V.S.; Savel'ev, S.E.; Yampol'skij, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTORS/critical current; SUPERCONDUCTORS/magnetic flux; ABRIKOSOV THEORY; MAGNETIC FIELDS; MATHEMATICAL MODELS; MEISSNER-OCHSENFELD EFFECT; SPATIAL DISTRIBUTION; SUPERCONDUCTORS

17056 (JINR-D–14-94-269(v.1), pp. 79) **Jump creep and interaction of magnetic vortices in inhomogeneous supreconductors.** Genkin, G.M.; Okomel'kov, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TYPE-II SUPERCONDUCTORS/kinetic equations; TYPE-II SUPERCONDUCTORS/magnetic flux; CREEP; LATTICE FIELD THEORY; MAGNETIC PROPERTIES; MATHEMATICAL MODELS; POTENTIALS; TUNNEL EFFECT

17057 (JINR-D–14-94-269(v.1), pp. 84) **Self-arranged critical state of Josephson lattices and granular superconductors.** Ginzburg, S.L. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. JOSEPHSON JUNCTIONS/critical current; SUPERCONDUCTORS/critical current; CRITICAL FIELD; CRYSTAL LATTICES; EQUATIONS OF STATE; SUPERCONDUCTIVITY; SUPERCONDUCTORS

17058 (JINR-D–14-94-269(v.1), pp. 85-86) **Electron-phonon mechanism in electric conductivity in high-T_c superconductors $Ba_{1-x}K_xBiO_3$.** Glovashkin, A.I. (AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.); Gudenko, A.V.; Zherikhina, L.N.; Zhurkin, B.G.; Tskhovrebov, A.M.; Norton, M.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HIGH-TC SUPERCONDUCTORS/electric conductivity; HIGH-TC SUPERCONDUCTORS/electron-phonon coupling; BARIUM COMPOUNDS; BISMUTH OXIDES; MONOCRYSTALS; POTASSIUM COMPOUNDS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0400-1000 K

17059 (JINR-D–14-94-269(v.1), pp. 87-88) **Frequency modulation method for observation of nonstationary Josephson effect in multiple weak-coupling system with random parameters.** Golovashkin, A.I. (AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.); Gudenko, A.V.; Zherikhina, L.N.; Tskhovrebov, A.M.; Norton, M.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/josephson effect; BARIUM COMPOUNDS; BISMUTH OXIDES; FREQUENCY MODULATION; GHZ RANGE 01-100; POLYCRYSTALS; POTASSIUM COMPOUNDS

17060 (JINR-D–14-94-269(v.1), pp. 91-92) **Allowance for reversible vortex shift in the critical state model.** Gorbachev, V.S. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Savel'ev, S.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. SUPERCONDUCTORS/critical current; SUPERCONDUCTORS/magnetic flux; CRITICAL FIELD; LOCALITY; MATHEMATICAL MODELS; SUPERCONDUCTIVITY; SUPERCONDUCTORS

17061 (JINR-D–14-94-269(v.1), pp. 93-94) **Thermodynamics of Josephson system in a strong magnetic field.** Gorbachev, V.S. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Savel'ev, S.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. JOSEPHSON JUNCTIONS/thermodynamic properties; BINDING ENERGY; CRYSTAL LATTICES; HAMILTONIANS; MAGNETIC FIELDS; MAGNETIC FLUX; PENETRATION DEPTH; TRANSITION TEMPERATURE

17062 (JINR-D–14-94-269(v.1), pp. 95-96) **Exactly solvable microscopic model of critical state in rigid superconductor.** Gorbachev, V.S. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Savel'ev, S.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs., 2 figs. SUPERCONDUCTORS/magnetic flux; CRYSTAL LATTICES; MAGNETIC FIELDS; MATHEMATICAL MODELS; NONLINEAR PROBLEMS; PENETRATION DEPTH; SUPERCONDUCTORS; THERMODYNAMIC PROPERTIES

17063 (JINR-D–14-94-269(v.1), pp. 103-104) **The electric field induced by a longitudinal sound wave in inhomogeneous superconductors.** Gutlyanskij, E.D. (Rostovskij-na-Donu Gosudarstvennyj Univ., Rostov-na-Donu (Russian Federation). Nauchno-Issledovatel'skij Inst. Fiziki). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 1 fig. HIGH-TC SUPERCONDUCTORS/electric fields; BARIUM COMPOUNDS; CRYSTAL LATTICES; CUPRATES; LORENTZ FORCE; MAGNETIC FIELDS; MAGNETIC FLUX; MHZ RANGE 01-100; SUPERCONDUCTIVITY; ULTRASONIC WAVES; YTTRIUM COMPOUNDS

17064 (JINR-D–14-94-269(v.1), pp. 114-115) **Partial factors of isotopic shifts for oxygen atoms in the 1-2-3 system.** Zhernov, A.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Kulagina, T.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HIGH-TC SUPERCONDUCTORS/transition temperature; COUPLING CONSTANTS; CUPRATES; ELECTRON-PHONON COUPLING; OXYGEN; SPECTRAL SHIFT; VALENCE

17065 (JINR-D–14-94-269(v.1), pp. 116-117) **Neutron depolarization in the rotating $YBa_2Cu_3O_{6.9}$.** Zhuchenko, N.K. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki); Yagud, R.Z. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 1 fig. BARIUM COMPOUNDS/magnetic flux; CUPRATES/magnetic flux; YTTRIUM COMPOUNDS/magnetic flux; CERAMICS; CUPRATES; DEPOLARIZATION; HIGH-TC SUPERCONDUCTORS; MAGNETIC FIELDS; NEUTRONS; ROTATION

17066 (JINR-D–14-94-269(v.1), pp. 120-121) **Peak-effect in monocrystals and texturized $ReBa_2Cu_3O_y$ samples.** Zhukov, A.A. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation)); Klestov, S.A.; Murashov, V.A.; Gordeev, S.N.; Kupfer, Kh.; Yan, B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. CUPRATES/critical current; CUPRATES/magnetic flux; BARIUM COMPOUNDS; CRYSTAL LATTICES; CUPRATES; ELECTRIC FIELDS; MAGNETIC FIELDS; MONOCRYSTALS; SCALING LAWS; SUPERCONDUCTIVITY; THULIUM COMPOUNDS; YTTRIUM COMPOUNDS

17067 (JINR-D–14-94-269(v.1), pp. 122) **Depolarization.** Zhuchenko, N.K. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. TYPE-II SUPERCONDUCTORS/depolarization; TYPE-II SUPERCONDUCTORS/neutrons; CRITICAL FIELD; MAGNETIC FIELDS; MAGNETIC FLUX; POLARIZED BEAMS; SUPERCONDUCTIVITY; DEPOLARIZATION; NEUTRONS

17068 (JINR-D–14-94-269(v.1), pp. 134-135) **Detection in HTSC-semiconductor contacts at high potential barriers.** Kerner, Ya.I. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 2 figs. INSB SEMICONDUCTOR DETECTORS/high-tc superconductors; INSB SEMICONDUCTOR DETECTORS/josephson junctions; FREQUENCY DEPENDENCE; GHZ RANGE; HETEROJUNCTIONS; INDIUM ANTIMONIDES; SENSITIVITY; SUPERCONDUCTING DEVICES

17069 (JINR-D–14-94-269(v.1), pp. 138-139) **Superconductivity in structurally disordered system near quantum percolation transitions.** Kirpichenkov, V.Ya. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HIGH-TC SUPERCONDUCTORS/superconductivity; CONCENTRATION RATIO; CRYSTAL LATTICES; CUPRATES; ELECTRON-PHONON COUPLING; FERMI LEVEL; SUPERCONDUCTIVITY; LATTICE PARAMETERS; MAGNETIC FIELDS; MATHEMATICAL MODELS; ORDER-DISORDER TRANSFORMATIONS; PENETRATION DEPTH; STRONTIUM COMPOUNDS; TRANSITION TEMPERATURE

17070 (JINR-D–14-94-269(v.1), pp. 140-141) **Size effect in thin metal oxide films as a test of coupling of superconducting pairing.** Kirpichenkov, V.Ya. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. SUPERCONDUCTING FILMS/transition temperature; BCS THEORY; BISMUTH OXIDES; COHERENCE LENGTH; CUPRATES; SUPERCONDUCTIVITY; THICKNESS; THIN FILMS

17071 (JINR-D–14-94-269(v.1), pp. 146-147) **Collective oscillations in superconductors with nonmagnetic localized states.** Kon, L.Eh. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki); Chobany, I.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. VIBRATIONAL STATES/superconductors; ELECTRONS; FERMI LEVEL; HOLES; LATTICE VIBRATIONS; ORDER PARAMETERS; OSCILLATION MODES; PHONONS; POISSON EQUATION; SUPERCONDUCTORS

17072 (JINR-D–14-94-269(v.1), pp. 149) **Anomalous behaviour of the diamagnetic profile of superconducting niobium near the vacuum boundary north.** Korneev, D.A.; Chernichenko, L.P.; Petrenko, A.V.; Balalykin, N.I.; Skrypnyak, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTING FILMS/niobium; SUPERCONDUCTING FILMS/penetration depth; JOSEPHSON JUNCTIONS; MAGNETIC FIELDS; POLARIZED BEAMS; NIOBIUM; TEMPERATURE RANGE 0013-0065 K; THERMAL NEUTRONS

17073 (JINR-D–14-94-269(v.1), pp. 153-154) **High-T_c superconductors from the viewpoint of surface effects.** Krotov, Yu.A. (AN SSSR, Makhachkala (Russian Federation). Fizicheskij Inst.); Suslov, I.M. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/ transition temperature; CRYSTAL STRUCTURE; DIAGRAMS; INTERATOMIC DISTANCES; ORDER PARAMETERS; SUPERCONDUCTIVITY

17074 (JINR-D–14-94-269(v.1), pp. 171-172) **On the instability of magnetic flux branching in superconductors.** Maksimov, I.L. (Gor'kovskij Gosudarstvennyj Univ., Gorki (Russian Federation)). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. TYPE-II SUPERCONDUCTORS/ magnetic flux; ELECTRONS; MAGNETIC FIELDS; PENETRATION DEPTH; PHONONS; SUPERCONDUCTIVITY; UMKLAPP PROCESSES

17075 (JINR-D–14-94-269(v.1), pp. 173-174) **Pinning effect of Abrikosov vortices on the dynamics of localized structures in type 2 superconductors in the mode of magnetic flux creep.** Maksimov, I.L. (Gor'kovskij Gosudarstvennyj Univ., Gorki (Russian Federation)); Ranchin, V.V.; Shalaev, I.Yu. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. TYPE-II SUPERCONDUCTORS/ magnetic flux; ABRIKOSOV THEORY; CRYSTAL DEFECTS; SUPERCONDUCTIVITY

17076 (JINR-D–14-94-269(v.1), pp. 175-176) **Electrodynamic model of nonstationary josephson effect in small-size junctions.** Malinovskij, L.L. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. SUPERCONDUCTING JUNCTIONS/josephson effect; COHERENCE LENGTH; CRITICAL CURRENT; MATHEMATICAL MODELS; ORDER PARAMETERS; SIZE

17077 (JINR-D–14-94-269(v.1), pp. 183) **Homogeneous spin doping of copper planes in $Tl_2Ba_2Ce_2Cu_3O_{1-\delta}$ according to ^{63}Cu, ^{17}O, ^{205}Tl NMR data.** Mikhalev, K.N. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Piskunov, Yu.V.; Verkhovskij, S.V.; Zhdanov, Yu.I.; Taldenkov, A.N.; Inyushkin, A.V.; Shustov, L.D.; Yakubovskij, A.Yu. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. CUPRATES/high-tc superconductors; BISMUTH COMPOUNDS; CALCIUM COMPOUNDS; COPPER 63; CRYSTAL DOPING; CRYSTAL STRUCTURE; CUPRATES; MAGNETIC SUSCEPTIBILITY; NUCLEAR MAGNETIC RESONANCE; OXYGEN 17; STRONTIUM COMPOUNDS; THALLIUM 205

17078 (JINR-D–14-94-269(v.1), pp. 184) **Superconductivity of multipolaron system with strong electron correlation.** Moskalenko, V.A. (AN Moldavskoj SSR, Kishinev (Moldova, Republic of). Inst. Prikladnoj Fiziki); Porchesku, I.G.; Dogotar', L.D. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SUPERCONDUCTIVITY/polarons; SUPERCONDUCTIVITY/strong interactions; BAND THEORY; COULOMB FIELD; ELECTRON CORRELATION; PHONONS; SUPERCONDUCTIVITY; POLARONS

17079 (JINR-D–14-94-269(v.1), pp. 187-190) **Contribution of copper atoms to the phonon density in Y-Ba-Cu-O high-tc superconductor. Localization of Cu_2 atomic vibrations.** Natkanets, I. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Syrkin, E.S.; Feodos'ev, S.B.; Fedotov, V.K. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. HIGH-TC SUPERCONDUCTORS/lattice vibrations; HIGH-TC SUPERCONDUCTORS/ superconductivity; ATOMIC MODELS; BARIUM COMPOUNDS; CRYSTAL LATTICES; CUPRATES; HARMONIC OSCILLATOR MODELS; SUPERCONDUCTIVITY; PHONONS; YTTRIUM COMPOUNDS

17080 (JINR-D–14-94-269(v.1), pp. 195-196) **Investigation by the NMR method of the critical state in superconductor $Tl_2Ba_2CuO_{6+\delta}$.** Nikolaev, E.G. (AN SSSR, Moscow (Russian Federation). Inst. Fizicheskikh Problem). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. HIGH-TC SUPERCONDUCTORS/ critical current; HIGH-TC SUPERCONDUCTORS/nuclear magnetic resonance; BARIUM OXIDES; COPPER OXIDES; CRYSTALS; MAGNETIC FIELDS; MAGNETIC FLUX; NMR SPECTRA; THALLIUM OXIDES

17081 (JINR-D–14-94-269(v.1), pp. 197-198) **The absence of Abrikosov vortex state transition in two-dimensional type-ii superconductors with weak pinning effect.** Oboznov, V.A. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Nikulov, A.V.; Remizov, D.B. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. NIOBIUM OXIDES/ superconductivity; TYPE-II SUPERCONDUCTORS/magnetic flux; TYPE-II SUPERCONDUCTORS/niobium oxides; FLUCTUATIONS; MAGNETIC FIELDS; SUPERCONDUCTIVITY; THIN FILMS; TWO-DIMENSIONAL CALCULATIONS; VORTICES

17082 (JINR-D–14-94-269(v.1), pp. 199-200) **About the existence of Abrikosov vortex state in two-dimensional type-ii superconductors without pinning centers.** Nikulov, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature*

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Short communication. 3 refs. TYPE-II SUPERCONDUCTORS/superconductivity; ABRIKOSOV THEORY; CRITICAL FIELD; FLUCTUATIONS; MAGNETIC FLUX; THERMODYNAMIC PROPERTIES; TWO-DIMENSIONAL CALCULATIONS; SUPERCONDUCTIVITY

17083 (JINR-D–14-94-269(v.1), pp. 220-221) **Investigation of the detecting response of superconducting structures on the frequency up to 2 THz.** Prokopenko, G. (AN SSSR, Moscow (Russian Federation). Inst. Radiotekhniki i Elektroniki); Tarasov, M.; Koshelets, V.; Shitov, S.; Lapitskaya, I.; Jacobson, S.; Kollberg, E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 figs. SUPERCONDUCTING DEVICES/heterojunctions; SUPERCONDUCTING DEVICES/response functions; ELECTRICAL INSULATORS; ENERGY GAP; FOURIER ANALYSIS; FREQUENCY DEPENDENCE; GHZ RANGE 100-1000; HETEROJUNCTIONS; SUPERCONDUCTORS

17084 (JINR-D–14-94-269(v.1), pp. 232-233) **Phase transitions in the vortex system of a two-dimensional superconductor.** Ryzhov, V.N.; Tareeva, E.E. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. TYPE-II SUPERCONDUCTORS/phase transformations; TYPE-II SUPERCONDUCTORS/superconductivity; MAGNETIC FIELDS; MAGNETIC FLUX; PENETRATION DEPTH; SUPERCONDUCTING FILMS; THIN FILMS; TWO-DIMENSIONAL CALCULATIONS; SUPERCONDUCTIVITY

17085 (JINR-D–14-94-269(v.1), pp. 235) **Positronium in high-Tc superconductors.** Sedov, V.L. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Fizicheskij Fakul'tet); Kuznetsov, S.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. POSITRONIUM/high-tc superconductors; CRYSTAL DEFECTS; FERMI LEVEL; GROUND STATES; LEVEL WIDTHS; LIFETIME; POSITRONIUM; SUPERCONDUCTIVITY

17086 (JINR-D–14-94-269(v.1), pp. 237-238) **Superconducting long-range order in a mixed state.** Sergeeva, G.G. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. SUPERCONDUCTIVITY/order parameters; SUPERCONDUCTIVITY/three-dimensional calculations; CRYSTAL LATTICES; HIGH-TC SUPERCONDUCTORS; MAGNETIC FLUX; SIZE; SUPERCONDUCTIVITY; TYPE-II SUPERCONDUCTORS

17087 (JINR-D–14-94-269(v.1), pp. 253-254) **Neutron-diffraction studies of the temperature dependence of $La_2CuO_{4.1}$ superconductor's dynamics.** Syrykh, G.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Glazkov, V.P.; Sashin, I.L.; Goremychkin, E.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs., 2 figs. CUPRATES/lattice vibrations; CUPRATES/superconductivity; LANTHANUM COMPOUNDS/lattice vibrations; LANTHANUM COMPOUNDS/superconductivity; ANTIFERROMAGNETIC MATERIALS; CUPRATES; SUPERCONDUCTIVITY; HIGH-TC SUPERCONDUCTORS; NEUTRON DIFFRACTION; PHONONS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; TRANSITION TEMPERATURE

17088 (JINR-D–14-94-269(v.1), pp. 265-266) **Investigation in the infrared spectroscopy range on the synchrotron radiation beam of HTSC film emission.** Tyutyunnikov, S.I.; Shalyapin, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref., 2 figs. SUPERCONDUCTING FILMS/synchrotron radiation; SUPERCONDUCTING FILMS/transmission; BARIUM OXIDES; COPPER OXIDES; HIGH-TC SUPERCONDUCTORS; INFRARED SPECTRA; TRANSMISSION; TEMPERATURE RANGE 0065-0273 K; YTTRIUM OXIDES

17089 (JINR-D–14-94-269(v.1), pp. 274-275) **Study on the penetration of the rotating radio-frequency field into HTSC ceramics.** Khavronin, V.P. (AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki); Ginzburg, S.L.; Luzyanin, I.D. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 3 figs. HIGH-TC SUPERCONDUCTORS/harmonics; HIGH-TC SUPERCONDUCTORS/radiowave radiation; AMPLITUDES; CERAMICS; CRITICAL CURRENT; HARMONICS; MAGNETIC FIELDS; PHYSICAL RADIATION EFFECTS; ROTATION; SUPERCONDUCTIVITY

17090 (JINR-D–14-94-269(v.1), pp. 276-277) **Superconduction of electrons with spin correlation.** Kholopov, E.V. (AN SSSR, Novosibirsk (Russian Federation). Inst. Neorganicheskoj Khimii). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/electron correlation; HIGH-TC SUPERCONDUCTORS/superconductivity; BAND THEORY; SUPERCONDUCTIVITY; SPIN ORIENTATION

17091 (JINR-D–14-94-269(v.1), pp. 287-288) **Study on the vortice lattice in $YBa_2Cu_3O_{7-\delta}$ monocrystals by the EPR-decoring.** Shvachko, Yu.N. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Koshta, A.A.; Romanyukha, A.A.; Naumov, S.V.; Ustinov, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs., 3 figs. HIGH-TC SUPERCONDUCTORS/magnetic flux; HIGH-TC SUPERCONDUCTORS/penetration depth; BARIUM COMPOUNDS; CUPRATES; ELECTRON SPIN RESONANCE; MONOCRYSTALS; YTTRIUM COMPOUNDS

17092 (JINR-D–14-94-269(v.1), pp. 289-290) **Features of the condenser superconductivity at the presence of interband junctions.** Shevchenko, S.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. SUPERCONDUCTIVITY/electron-hole coupling; SUPERCONDUCTIVITY/heterojunctions; BAND THEORY; BRILLOUIN ZONES; ENERGY-LEVEL TRANSITIONS; SOLITONS; SUPERCONDUCTIVITY; HETEROJUNCTIONS

17093 (JINR-D–14-94-269(v.1), pp. 293-294) **Volt-ampere characteristics of the tunnel HTSC-insulator-HTSC structure in the layer model.** Shukrinov, Yu.M. (AN Tadzhikskoj SSR, Dushanbe (Tajikistan). Fiziko-Tekhnicheskij Inst.); Nasrulloev, Kh.; Sarkhadov, I.; Stetsenko, A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. HIGH-TC SUPERCONDUCTORS/heterojunctions; HIGH-TC SUPERCONDUCTORS/tunnel effect; ABRIKOSOV THEORY; ELECTRIC CONDUCTIVITY; ELECTRICAL INSULATORS; HETEROJUNCTIONS; MATHEMATICAL MODELS; SUPERCONDUCTIVITY

17094 (JINR-D–14-94-269(v.1), pp. 295-296) **Tunnel characteristics of the normal metal-insulator-HTSC structure in the layer model.** Shukrinov, Yu.M. (AN Tadzhikskoj SSR, Dushanbe (Tajikistan). Fiziko-Tekhnicheskij Inst.); Nasrulloev, Kh.; Mirzoaminov, Kh.M.; Sarkhadov, I.; Istamov, F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 296p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 1. Fundamental questions of superconductivity including HTSC.* Order Number DE95627617. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HETEROJUNCTIONS/high-tc superconductors; HETEROJUNCTIONS/tunnel effect; ABRIKOSOV THEORY; ELECTRICAL INSULATORS; HETEROJUNCTIONS; MATHEMATICAL MODELS; METALS

17095 (JINR-E–17-93-335, pp. 142) **On the possibility of high temperature superconductivity due to the 'Coulomb' mechanisms of the cooper pairing of charge carriers.** Pashitskij, E.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. SUPERCONDUCTIVITY/cooper pairs; SUPERCONDUCTIVITY/copper; CHARGE CARRIERS; COULOMB SCATTERING; HIGH-TC SUPERCONDUCTORS; SUPERCONDUCTIVITY; COPPER; TRANSITION TEMPERATURE

17096 (JINR-E–17-93-335, pp. 143) **Electronic structure of ideal and disordered HTSC-polymer Langmuir Bladgett films on epitaxial YBaCuO surfaces.** Fink, C.; Klauda, L.; Kragler, K.; Markl, J.; Bauer, P.; Saemann-Ischenko, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/electronic structure; SUPERCONDUCTING FILMS/electronic structure; BARIUM COMPOUNDS; CUPRATES; ELECTRON BEAMS; ELECTRON SPECTROSCOPY; NEODYMIUM COMPOUNDS; POLYMERS; STRONTIUM COMPOUNDS; SUBSTRATES; TRANSITION TEMPERATURE; YTTRIUM COMPOUNDS

17097 (JINR-E–17-93-335, pp. 144) **Temperature dependence of the electromagnetic penetration depth and fluctuation paraconductivity in the $(Y,Sm)_1Ba_2Cu_3O_{7-x}$ epitaxial films.** Gasparov, V.A. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Habelt, P.; Schindler, W. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BARIUM COMPOUNDS/electric conductivity; CUPRATES/electric conductivity; SAMARIUM COMPOUNDS/electric conductivity; YTTRIUM COMPOUNDS/electric conductivity; CUPRATES; ELECTROMAGNETIC FIELDS; PENETRATION DEPTH; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; THIN FILMS; TRANSITION TEMPERATURE

17098 (JINR-E–17-93-335, pp. 145) **Investigation of AC Josephson effect in YBaCuO.** Katkov, A.S. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Krzhimovskij, V.I.; Kozyrev, S.V.; Ioffe, A.F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. BARIUM COMPOUNDS/josephson effect; BARIUM COMPOUNDS/josephson junctions; CUPRATES/josephson effect; CUPRATES/josephson junctions; YTTRIUM COMPOUNDS/josephson effect; YTTRIUM COMPOUNDS/josephson junctions; CRYSTALS; CUPRATES; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; THIN FILMS

17099 (JINR-E–17-93-335, pp. 146) **Phase states and transitions in flux lattice in superconducting films.** Prokhorov, V.G. (AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Metallofiziki); Kaminskij, G.G.; Kasatkin, A.L.; Pan, V.M.; Tretiatchenko, C.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/superconducting films; CUPRATES/superconducting films; GERMANIUM ALLOYS/superconducting films; MOLYBDENUM ALLOYS/superconducting films; NIOBIUM ALLOYS/superconducting films; RHENIUM ALLOYS/superconducting films; YTTRIUM COMPOUNDS/superconducting films; AMORPHOUS STATE; CUPRATES; ELECTRIC CONDUCTIVITY; HIGH-TC SUPERCONDUCTORS; INTERMETALLIC COMPOUNDS; MAGNETIC FIELDS; MAGNETIC FLUX; PHASE TRANSFORMATIONS

17100 (JINR-E–17-93-335, pp. 148-149) **X-ray diffraction study of Nd_2CuO_4.** Makarova, I.P. (AN SSSR, Moscow (Russian Federation). Inst. Kristallografii); Tamazyan, R.A.; Molchanov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. CUPRATES/crystal structure; NEODYMIUM COMPOUNDS/crystal structure; CUPRATES; MONOCRYSTALS; SPACE GROUPS; X-RAY DIFFRACTION

17101 (JINR-E–17-93-335, pp. 150) **Infrared spectra of optical phonons and conductivity of semiconducting La_2CuO_{4+x} single crystals.** Bazhenov, A.V. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Rezchikov, K.B.; Fursova, T.N.; Zakharov, A.A.; Tsetlin, M.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. CUPRATES/electric conductivity; CUPRATES/infrared spectra; LANTHANUM COMPOUNDS/electric conductivity; LANTHANUM COMPOUNDS/infrared spectra; CUPRATES; MONOCRYSTALS; PHONONS; SEMICONDUCTOR MATERIALS

17102 (JINR-E–17-93-335, pp. 152) **Thermal conductivity of high-Tc superconductors.** Wolkhausen, T. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HIGH-TC SUPERCONDUCTORS/thermal conductivity; ANISOTROPY; COOPER PAIRS; ORDER PARAMETERS; PHONONS; STRONG-COUPLING MODEL

17103 (JINR-E–17-93-335, pp. 155) **The structure of a moving Abrikosov vortex in magnetic superconductor.** Krivoruchko, V.N. (AN Ukrainskoj SSR, Donetsk (Ukraine). Fiziko-Tekhnicheskij Inst.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. TYPE-II SUPERCONDUCTORS/magnetic flux; MAGNETIC FIELDS; PENETRATION DEPTH

17104 (JINR-E–17-93-335, pp. 156) **Investigation of the gap symmetry by electronic Raman scattering.** Hackl, R.; Stadlober, B.; Devereaux, T.P.; Einzel, D.; Neumeier, J.J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/raman spectra; CUPRATES; RAMAN EFFECT; SYMMETRY GROUPS; TRANSITION TEMPERATURE

17105 (JINR-E–17-93-335, pp. 157) **The anisotropy of resistivity and thermoelectric power of the $Nd_{1.85}Ce_{0.15}CuO_{4-\delta}$ single crystal.** Ponomarev, A.I. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Krylov, K.R.; Charikova, T.B.; Tsidilkovskij, V.I.; Leonyuk, L.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. CERIUM COMPOUNDS/electric conductivity; CUPRATES/electric conductivity; NEODYMIUM COMPOUNDS/electric conductivity; ANISOTROPY; CUPRATES; MONOCRYSTALS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0065-0273 K; THERMOELECTRICITY; TRANSITION TEMPERATURE

17106 (JINR-E–17-93-335, pp. 158) **Microstructure, levitation properties of textured YBCO samples.** Bashkirov, Yu.A. (Moskovskij Ehnergeticheskij Inst., Moscow (Russian Federation)); Flejshman, L.S.; Vdovin, A.B.; Zubritskij, I.A.; Smirnov, V.V.; Vinogradov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/yttrium compounds; BISMUTH COMPOUNDS; CERAMICS; CRITICAL CURRENT; CRYSTAL GROWTH; CUPRATES; CURRENT DENSITY; GRAIN ORIENTATION; MICROSTRUCTURE; TEXTURE; TRANSITION TEMPERATURE; USES

17107 (JINR-E–17-93-335, pp. 159) **Coexistence of localized (polarons) and delocalized (band) states at the Fermi energy of the Bi-2212 Y/Ca superconductors.** Ruscher, C.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. CALCIUM COMPOUNDS/absorption spectra; CUPRATES/absorption spectra; YTTRIUM COMPOUNDS/absorption spectra; BAND THEORY; BARIUM COMPOUNDS; BISMUTH COMPOUNDS; CUPRATES; LANTHANUM COMPOUNDS; POLARONS

17108 (JINR-E–17-93-335, pp. 160) **The entrainment effect of vortices by ultrasound waves in high-temperature superconductors.** Gutlyanskij, E.D. (Rostovskij-na-Donu Gosudarstvennyj Univ., Rostov-na-Donu (Russian Federation). Nauchno-Issledovatel'skij Inst. Fiziki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282–: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/magnetic flux; BARIUM COMPOUNDS; CERAMICS; CUPRATES; ULTRASONIC WAVES; YTTRIUM COMPOUNDS

17109 (JINR-E–17-93-335, pp. 161) **The interaction of ultrasound waves with vortex structure in the TAFF region of HTSC.** Gutlyanskij, E.D. (Rostovskij-na-Donu Gosudarstvennyj

Univ., Rostov-na-Donu (Russian Federation). Nauchno-Issledovatel'skij Inst. Fiziki). Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH-TC SUPERCONDUCTORS/magnetic flux; ATTENUATION; EQUATIONS OF MOTION; MAGNETIC FIELDS; ULTRASONIC WAVES

17110 (JINR-E--17-93-335, pp. 162) **YBCO step edge junctions for magnetically tunable resonators.** Vogt, A. (and others); Dolata, R.; Herwig, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SQUID DEVICES/superconducting junctions; GALLIUM OXIDES; GHZ RANGE 01-100; JOSEPHSON JUNCTIONS; NEODYMIUM COMPOUNDS; SUBSTRATES; SUPERCONDUCTING CAVITY RESONATORS; TEMPERATURE RANGE 0065-0273 K

17111 (JINR-E--17-93-335, pp. 163) **Anisotropy of crystal lattice expansion crystalline electric fields and charge redistribution in high-Tc superconductors.** Mirmelstein, A. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Fiziki Metallov); Voronin, V.; Podlesnyak, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/anisotropy; BARIUM COMPOUNDS/high-tc superconductors; CUPRATES/anisotropy; CUPRATES/high-tc superconductors; PRASEODYMIUM COMPOUNDS/anisotropy; PRASEODYMIUM COMPOUNDS/high-tc superconductors; ANISOTROPY; CHARGE CARRIERS; CRYSTAL DEFECTS; CUPRATES; TRANSITION TEMPERATURE

17112 (JINR-E--17-93-335, pp. 170) **Studies of magnetization processes in high-T_c superconductors using magnetooptic techniques.** Polyanskij, A.A. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Doroshinskij, L.A.; Nikitenko, V.I.; Vlasko-Vlasov, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BARIUM COMPOUNDS/high-tc superconductors; BARIUM COMPOUNDS/magnetization; BARIUM COMPOUNDS/penetration depth; CUPRATES/high-tc superconductors; CUPRATES/magnetization; CUPRATES/penetration depth; YTTRIUM COMPOUNDS/high-tc superconductors; YTTRIUM COMPOUNDS/magnetization; YTTRIUM COMPOUNDS/penetration depth; MAGNETIZATION; CUPRATES; DOMAIN STRUCTURE; MAGNETIC FLUX; MAGNETO-OPTICAL EFFECTS; MONOCRYSTALS

17113 (JINR-E--17-93-335, pp. 171) **Investigations of spin correlations in oxide superconducting materials by two-magnon Raman scattering.** Maksimov, A.A. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Tartakovskij, I.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 figs. HIGH-TC SUPERCONDUCTORS/raman effect; BARIUM COMPOUNDS; CORRELATIONS; CUPRATES; INTERATOMIC DISTANCES; MAGNONS; MONOCRYSTALS; SPIN; YTTRIUM COMPOUNDS

17114 (JINR-E--17-93-335, pp. 172) **Anisotropy of electronic light scattering in $YBa_2Cu_3O_{6+x}$ crystals.** Tartakovskij, I.I. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Maksimov, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 fig. BARIUM COMPOUNDS/raman effect; CUPRATES/raman effect; YTTRIUM COMPOUNDS/raman effect; ANISOTROPY; CUPRATES; MONOCRYSTALS; RAMAN SPECTRA; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

17115 (JINR-E--17-93-335, pp. 173) **New correlations between critical temperature, structural and optical characteristics of high-temperature superconducting materials.** Usov, O.A. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Kartenko, N.F.; Goloshchapov, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. ALUMINIUM OXIDES/high-tc superconductors; BARIUM COMPOUNDS/high-tc superconductors; CUPRATES/high-tc superconductors; YTTRIUM COMPOUNDS/high-tc superconductors; ANISOTROPY; CRYSTAL LATTICES; CUPRATES; OPTICAL PROPERTIES; TRANSITION TEMPERATURE

17116 (JINR-E--17-93-335, pp. 174) **Anomalous Hall effect and current-voltage characteristics in $REBa_2Cu_3O_{7-\delta}$ epitaxial films.** Khasanov, I. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Fink, C.; Hopfergaetner, R.; Lippert, M.; Saemann-Ischenko, G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. BARIUM COMPOUNDS/hall effect; BARIUM COMPOUNDS/superconducting films; CUPRATES/hall effect; CUPRATES/superconducting films; SAMARIUM COMPOUNDS/hall effect; SAMARIUM COMPOUNDS/superconducting films; YTTRIUM COMPOUNDS/hall effect; YTTRIUM COMPOUNDS/superconducting films; CUPRATES; ELECTRIC CONDUCTIVITY

17117 (JINR-E--17-93-335, pp. 175) **Observation of a disordered vortex state in $Bi_2Sr_2CaCu_2O_{8-x}$ single crystals containing columnar defects.** Vinnikov, L.Ya. (AN SSSR, Chernogolovka (Russian Federation). Inst. Fiziki Tverdogo Tela); Dugaev, M.; Khasanov, I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1993. 189p. (CONF-9309282--: 6. trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity (HTSC), Dubna (Russian Federation), 14-18 Sep 1993). In *6. Trilateral German-Russian-Ukrainian seminar on high-temperature superconductivity.* Order Number DE95619878. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. BISMUTH COMPOUNDS/magnetic flux; CALCIUM COMPOUNDS/magnetic flux; CUPRATES/

magnetic flux; STRONTIUM COMPOUNDS/magnetic flux; CRYSTAL DEFECTS; CUPRATES; HIGH-TC SUPERCONDUCTORS; MONOCRYSTALS; ORDER-DISORDER TRANSFORMATIONS

17118 (LA-UR–95-967) **Dynamics of current driven disordered Josephson junction arrays.** Dominguez, D.; Gronbech-Jensen, N.; Bishop, A.R. Los Alamos National Lab., NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9503124–1: Workshop on macroscopic quantum phenomena and coherence in superconducting networks, Frascati (France), 1-5 Mar 1995). Order Number DE95009418. Source: OSTI; NTIS; GPO Dep.

We present dynamical simulations of disordered Josephson junction arrays with a bias current. We study the IV characteristics and vortex dynamics as a function of integer frustration f = n, weak frustration f = n + δ ($\delta \ll 1$) and full frustration pairs close to the critical current i_c. We focus on the study of the plastic flow of vortices (f = n + δ), of vortex-antivortex pairs (f = n), and the dynamics of domain walls (f = n + 1/2) close to i_c. We analyze the voltage noise and vortex fluctuations in the plastic flow regimes. We obtain the phase diagram for the different dynamical regimes as a function of disorder and applied current. We also study the dynamical critical behavior of depinning close to i_c in the gauge glass limit of the model, f $\rightarrow \infty$, calculating critical exponents for the voltage onset and voltage fluctuations. We discuss our results within the context of present theories of the non-linear dynamics of disordered media.

665420 Superfluidity

17119 (JINR-D–14-94-269(v.2), pp. 2-3) **Stationary states and thermodynamical properties of ^{3}He-^{4}He solutions with the allowance for primeson iteraction.** Adamenko, I.N. (Khar'kovskij Gosudarstvennyj Univ., Kharkov (Ukraine)); Nemchenko, K.Eh.; Tsyganok, V.I.; Chervanev, A.I. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HELIUM 3/thermodynamic properties; HELIUM 4/thermodynamic properties; KNUDSEN FLOW; QUASI PARTICLES; SOLUTIONS; SUPERFLUIDITY

17120 (JINR-D–14-94-269(v.2), pp. 4-5) **New phase formation and growth in the process of stratification of ^{3}He-^{4}He superfluid solutions.** Adamenko, I.N. (Khar'kovskij Gosudarstvennyj Univ., Kharkov (Ukraine)); Nemchenko, K.Eh.; Tsyganok, V.I.; Chervanev, A.I.; Mikheev, V.A.; Rudavskij, Eh.Ya.; Chagovets, V.K.; Sheshin, G.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HELIUM 3/superfluidity; HELIUM 4/superfluidity; CONCENTRATION RATIO; SUPERFLUIDITY; METASTABLE STATES; PHASE STUDIES; PHASE TRANSFORMATIONS; QUANTUM FLUIDS; SOLUTIONS; TIME DEPENDENCE

17121 (JINR-D–14-94-269(v.2), pp. 11-12) **Experimental studies of coherently pressing magnetization structure in ^{3}He-^{4}He liquid solutions.** Vysotskij, A.S. (AN SSSR, Moscow (Russian Federation). Inst. Fizicheskikh Problem); Dmitriev, V.V.; Zakazov, S.R.; Moroz, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. HELIUM 3/domain structure; HELIUM 3/solutions; HELIUM 4/domain structure; HELIUM 4/solutions; SOLUTIONS; MAGNETIC FIELDS; MAGNETIZATION; PRECESSION; SUPERFLUIDITY

17122 (JINR-D–14-94-269(v.2), pp. 13-14) **Measurements of longitudinal magnetic relaxation time in ^{3}He-^{4}He liquid solutions at ultralow temperatures.** Vysotskij, A.S. (AN SSSR, Moscow (Russian Federation). Inst. Fizicheskikh Problem); Dmitriev, V.V.; Zakazov, S.R.; Moroz, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HELIUM 3/spin-spin relaxation; HELIUM 4/spin-spin relaxation; MAGNETIC FIELDS; RELAXATION TIME; SOLUTIONS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K

17123 (JINR-D–14-94-269(v.2), pp. 23) **Hedrodynamic fluctuations in superfluid helium in spatially bounded systems.** Zatovskij, A.V. (Odesskij Gosudarstvennyj Univ., Odessa (Ukraine)); Zvelindovskij, A.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HELIUM/hydrodynamics; CORRELATION FUNCTIONS; FLUCTUATIONS; HELIUM; HYDRODYNAMICS; LANGEVIN EQUATION; SPECTRAL DENSITY; SUPERFLUIDITY

17124 (JINR-D–14-94-269(v.2), pp. 32-33) **Conductivity of quasi-one-dimensional electron system over liquid helium.** Kovdlya, Yu.Z. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Nikolaenko, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HELIUM/electric conductivity; ANISOTROPY; ELECTRON MOBILITY; FLUID FLOW; HELIUM; MAGNETIC FIELDS; MHZ RANGE 01-100; ONE-DIMENSIONAL CALCULATIONS; SURFACES

17125 (JINR-D–14-94-269(v.2), pp. 35-36) **Nucleation centre density in concentrated phase at stratification of supersaturated superfluid ^{3}He-^{4}He solutions.** Majdanov, V.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Mikheev, V.A.; Omelaenko, N.F. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HELIUM 3/dissociation; HELIUM 3/nucleation; HELIUM 4/dissociation; HELIUM 4/nucleation; ACTIVATION ENERGY; DISSOCIATION; NUCLEATION; METASTABLE STATES; SOLUTIONS; SUPERFLUIDITY; SUPERSATURATION

17126 (JINR-D–14-94-269(v.2), pp. 37-38) **Nucleation rate at phase dissociation of superfluid ^{3}He-^{4}He solutions.** Mikheev, V.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Rudavskij, Eh.Ya.; Chagovets, V.K.; Sheshin, G.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HELIUM 3/dissociation; HELIUM 3/nucleation; HELIUM 4/dissociation; HELIUM 4/nucleation; DISSOCIATION; NUCLEATION; PHASE TRANSFORMATIONS; SOLUTIONS; SUPERFLUIDITY; SUPERSATURATION

17127 (JINR-D–14-94-269(v.2), pp. 39-40) **Liquid ^{3}He relaxation in confined geometry between dielectric crystals.** Naletov, V.V. (Kazanskij Gosudarstvennyj Univ., Kazan (Russian Federation)); Nazaretskij, E.A.; Tagirov, M.S.; Tayurskij, D.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HELIUM 3/nuclear magnetic resonance; CRYSTALS; CYLINDERS; DIELECTRIC MATERIALS; LITHIUM FLUORIDES; MAGNETIC FIELDS; SPIN-SPIN RELAXATION; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; THULIUM FLUORIDES; YTTRIUM FLUORIDES

17128 (JINR-D–14-94-269(v.2), pp. 41-42) **Modeling of ^{3}He-^{4}He solid solution phase dissociation.** Omelaenko, N.F. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Mikhin, N.P. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HELIUM 3/dissociation; HELIUM 4/dissociation; COMPUTERIZED SIMULATION; DISLOCATIONS; DISSOCIATION; NUCLEATION; PHASE TRANSFORMATIONS; SOLID SOLUTIONS; TIME DEPENDENCE

17129 (JINR-D–14-94-269(v.2), pp. 44) **Two-dimensional periodic deformation structures of superlattice type on the charged surface of fluid helium.** Rusanov, M.M. (Kishinevskij Gosudarstvennyj Univ., Kishinev (Moldova, Republic of)); Rusanov, A.M.; Pogorilko, G.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HELIUM/superlattices; FREE ENERGY; HELIUM; SUPERLATTICES; INTERFACES; QUANTUM FLUIDS; SURFACES; TWO-DIMENSIONAL CALCULATIONS

17130 (JINR-D–14-94-269(v.2), pp. 45-46) **Calorimetric detection of two-dimensional atomic hydrogen by NMR-induced two-body recombination.** Safonov, S.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Vasil'ev, S.A.; Lukashevich, I.I.; Yakkola, S.M.; Arvela, P.Kh.; Tyukanov, E.Zh. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. HELIUM/superfluidity; HYDROGEN/superfluidity; ADSORPTION; ATOMS; BOSE-EINSTEIN CONDENSATION; BOSE-EINSTEIN GAS; CALORIMETRY; HELIUM; SUPERFLUIDITY; HYDROGEN; NUCLEAR MAGNETIC RESONANCE; RECOMBINATION; SPIN ORIENTATION; SURFACES

17131 (JINR-D–14-94-269(v.2), pp. 49-50) **Equation for order parameter of superfluid Fermi liquid with triplet pairing near Tc in magnetic field.** Tarasov, A.N. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 7 refs. FERMI GAS/superfluidity; CORRECTIONS; SUPERFLUIDITY; FERMIONS; GINZBURG-LANDAU THEORY; HELIUM 3; MAGNETIC FIELDS; ORDER PARAMETERS; PAIRING INTERACTIONS; TRANSITION TEMPERATURE

17132 (JINR-D–14-94-269(v.2), pp. 57-58) **Dissociation equilibrium line in HCP ^{3}He weak solutions in ^{4}He.** Shvarts, V.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Usenko, A.M.; Mikhin, N.P.; Rudavskij, Eh.Ya.; Tokar', Yu.A.; Mikheev, V.A. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HELIUM 3/crystal-phase transformations; HELIUM 4/crystal-phase transformations; DISSOCIATION; FREE ENERGY; HCP LATTICES; LTE; NUCLEAR MAGNETIC RESONANCE; PHASE DIAGRAMS; PHASE STUDIES; PRESSURE DEPENDENCE; SOLID SOLUTIONS

17133 (JINR-E–11-90-204, pp. 89-90) **Deriving the variational formulation and canonical equations of motion for electropolarized superfluid helium with SAC REDUCE.** Bikov, V.V.; Gorskij, V.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HELIUM 2/equations of motion; HELIUM 2/superfluidity; CANONICAL TRANSFORMATIONS; SUPERFLUIDITY; POLARIZATION; R CODES

665430 Other Topics in Quantum Fluids and Solids

Refer also to citation(s) 16018

17134 (JINR-D–14-94-269(v.2), pp. 16) **Laser spectroscopy of metastable RG($^3P_{0,2}$) atoms in liquid and solid helium.** Gordon, E.B.; Martynenko, M.V.; Pel'menev, A.A.; Popov, E.A.; Khmelenko, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. KRYPTON/helium; KRYPTON/metastable states; NEON/helium; NEON/metastable states; FLUIDS; FLUORESCENCE SPECTROSCOPY; KRYPTON; HELIUM; LASER SPECTROSCOPY; MIXTURES; NEON; SOLIDS

17135 (JINR-D–14-94-269(v.2), pp. 17-18) **Impurity-stabilized solid helium.** Gordon, E.B.; Pel'menev, A.A.; Popov, E.A.; Khmelenko, V.V. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. HELIUM/solid clusters; HELIUM/van der waals forces; NITROGEN/metastable states; NITROGEN/van der waals forces; ATOMS; DOPED MATERIALS; HELIUM; MOLECULES; NITROGEN; PHASE STUDIES; STOICHIOMETRY; TEMPERATURE RANGE 0000-0013 K

17136 (JINR-D–14-94-269(v.2), pp. 19-20) **Temperature dependence of diffusion flow of ^{3}He BCC crystals of low density.** Dyumin, N.E. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Bojko, V.V.; Grigor'ev, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 5 refs. HELIUM 3/self-diffusion; HELIUM 3/vacancies; BCC LATTICES; CRYSTALS; SELF-DIFFUSION; VACANCIES; MASS TRANSFER; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K

17137 (JINR-D–14-94-269(v.2), pp. 21-22) **Vacancy kinetics in ^{4}He crystals.** Dyumin, N.E. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Zuev, N.V.; Bojko, V.V.; Grigor'ev, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. SELF-DIFFUSION; BCC LATTICES; HCP LATTICES; HELIUM 4; SELF-DIFFUSION; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0000-0013 K; VACANCIES

17138 (JINR-D–14-94-269(v.2), pp. 25-26) **Vorties in rotating helium II in rings of arbitrary size.** Zueva, T.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HELIUM II/superfluidity; HELIUM II/vortices; ANGULAR VELOCITY; SUPERFLUIDITY; VORTICES; HYDRODYNAMICS; ROTATION

17139 (JINR-D–14-94-269(v.2), pp. 27-28) **Behaviour of surface electrons over superfluid helium in magnetic field near the transition to Wigner crystal.** Kirichek, O.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Kovdrya, Yu.Z.; Berkutov, I.B.; Grigor'ev, V.N. Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. HELIUM/crystallization; HELIUM/electron mobility; ELECTRON DENSITY; HELIUM; CRYSTALLIZATION; MAGNETIC FIELDS; MHZ RANGE 100-1000; SUPERFLUIDITY; TEMPERATURE DEPENDENCE

17140 (JINR-D–14-94-269(v.2), pp. 55) **Free He^4 crystal's face growth rate.** Tsymbalenko, V.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. HELIUM 4/crystal growth; DISLOCATIONS; GRAIN GROWTH; KINETICS; SUPERSATURATION

17141 (JINR-D–14-94-269(v.2), pp. 56) **Sound anomalous scattering from a face of a quantum crystal.** Tsymbalenko, V.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii). Rossijskaya Akademiya Nauk, Moscow (Russian Federation); Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 299p. (In Russian). (CONF-940961–: International conference on low-temperature physics, Dubna (Russian Federation), 6-9 Sep 1994). In *Summaries of reports of the 30. Conference on low-temperature physics. Pt. 2. Quantum liquids and crystals. Low-temperature solid-state physics. Electron phenomena at low temperatures.* Order Number DE95627574. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. HELIUM/sound waves; CRYSTALS; EQUATIONS OF MOTION; HELIUM; RESONANCE SCATTERING; SURFACES; WAVE PROPAGATION

6655 Direct Energy Conversion

17142 (DOE/PC/90297–T11) **Impact of nonequilibrium particle temperature considerations on seeded coal combustion plasma properties. Quarterly report, quarter No. 10, January 1, 1993–March 30, 1993.** Oni, A.A. Morgan State Univ., Baltimore, MD (United States). School of Engineering. [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90297. Order Number DE95009817. Source: OSTI; NTIS; GPO Dep.

The first of the three tasks of this research activity is to develop a model that represents steady, nonequilibrium energy interactions between post-combustion entrained particles and carrier gases, under typical coal-fired MHD operating conditions. The second task is to use the developed model to evaluate, for both the MHD linear

channel and disk configurations, the impact of nonequilibrium particle temperatures on predicted gasdynamic and electrical property values that depend, at times critically, on plasma temperatures, and on which the overall MHD system performance depends. The third task is to evaluate the relative impact of gas-particle temperature differences on generator slag phenomena and consequently on MHD channel performance.

17143 (DOE/PC/90297–T13) **Impact of nonequilibrium particle temperature considerations on seeded coal combustion plasma properties. Quarterly report, quarter No. 12, July 1, 1993–September 30, 1993.** Oni, A.A. Morgan State Univ., Baltimore, MD (United States). School of Engineering. [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90297. Order Number DE95009819. Source: OSTI; NTIS; GPO Dep.

The first of the three tasks of this research activity is to develop a model that represents steady, nonequilibrium energy interactions between post-combustion entrained particles and carrier gases, under typical coal-fired MHD operating conditions. The second task is to use the developed model to evaluate, for both the MHD linear channel and disk configurations, the impact of nonequilibrium particle temperatures on predicted gasdynamic and electrical property values that depend, at times critically, on plasma temperatures, and on which the overall MHD system performance depends. The third task is to evaluate the relative impact of gas-particle temperature differences on generator slag phenomena and consequently on MHD channel performance.

17144 (NIFS–320) **Computer simulation of a magnetohydrodynamic dynamo. 2.** Kageyama, Akira; Sato, Tetsuya. National Inst. for Fusion Science, Nagoya (Japan). Nov 1994. 51p. Order Number DE95767949. Source: OSTI; NTIS; INIS.

We performed a computer simulation of a magnetohydrodynamic dynamo in a rapidly rotating spherical shell. Extensive parameter runs are carried out changing the electrical resistivity. It is found that the total magnetic energy can grow more than ten times larger than the total kinetic energy of the convection motion when the resistivity is sufficiently small. When the resistivity is relatively large and the magnetic energy is comparable or smaller than the kinetic energy, the convection motion maintains its well-organized structure. However, when the resistivity is small and the magnetic energy becomes larger than the kinetic energy, the well-organized convection motion is highly disturbed. The generated magnetic field is organized as a set of flux tubes which can be divided into two categories. The magnetic field component parallel to the rotation axis tends to be confined inside the anticyclonic columnar convection cells. On the other hand, the component perpendicular to the rotation axis is confined outside the convection cells. (author).

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Refer also to citation(s) 15677

7003 Plasma Physics and Fusion Research

Refer also to citation(s) 16761, 16775, 16942, 17241, 17263, 17312

17145 (BARC–1994/P/004) **Laser and Plasma Technology Division annual report 1993.** Venkatramani, N. (Bhabha Atomic Research Centre, Bombay (India). Laser and Plasma Technology Div.); Verma, R.L. (eds.). Bhabha Atomic Research Centre, Bombay (India). 1994. 136p. Order Number DE95628321. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes the activities of the Laser and Plasma Technology Division during the year 1993. This Division is engaged in the research and development of high power beams namely laser, plasma and electron beams, which are characterized by high power density, normally in excess of 1 kW/mm^2. Laser and Plasma Technology Division has strived to establish indigenous capability to cater to the requirements of the Department of Atomic Energy. The broad programme objectives of the Division are : (1) Development and technology readiness studies of laser, plasma and electron beam devices, (2) Studies on related physical phenomena with a view to gain better understanding of the devices, and (3) Improvements in technology and exploration of new areas. This report covers the activities of the Division during 1993 and describes how successfully the objectives have been met. The activities described in the report are diverse in nature. The report has been compiled from individual reports of various groups/sections with marginal editing. (author). refs., tabs., figs.

17146 (DOE/ER–0313/16, pp. 505-511) **Neutron damage to diagnostic mirrors.** Farnum, E.H. (Los Alamos National Lab., NM (United States)); Clinard, F.W. Jr.; Regan, S.P.; Schunke, B. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Diagnostic systems for fusion reactors will require mirrors capable of reflecting electromagnetic radiation in the soft x-ray, near uv, visible, and ir wavelengths. These components will be exposed to significant fluences of fast neutrons during use. Mirrors made from alternating layers of low-Z and high-Z materials were irradiated to a fluence of 1.1 x 10^{23} n/m^2 at 270-300°C, and subsequently evaluated for structural changes and in some cases changes in optical properties. Short-wavelength mirrors retained their structural integrity while exhibiting slight changes in reflectance; some long-wavelength mirrors showed structural degradation, while others did not. These results are discussed in terms of materials damage effects and possibilities for improvement of mirror performance under severe operating conditions.

17147 (DOE/ET/53088–691) **Reynolds stress of localized toroidal modes.** Zhang, Y.Z. (International Center for Theoretical Studies, Trieste (Italy)); Mahajan, S.M. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Feb 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–691). Order Number DE95008750. Source: OSTI; NTIS; INIS; GPO Dep.

An investigation of the 2D toroidal eigenmode problem reveals the possibility of a new consistent 2D structure, the dissipative BM-II mode. In contrast to the conventional ballooning mode, the new mode is poloidally localized at $\pi/2$ (or $-\pi/2$), and possesses significant radial asymmetry. The radial asymmetry, in turn, allows the dissipative BM-II to generate considerably larger Reynolds stress as compared to the standard slab drift type modes. It is also shown that a wide class of localized dissipative toroidal modes are likely to be of the dissipative BM-II nature, suggesting that at the tokamak edge, the fluctuation generated Reynolds stress (a possible source of poloidal flow) can be significant.

17148 (DOE/ET/53088–694) **Stabilization of the resistive shell mode in tokamaks.** Fitzpatrick, R.; Aydemir, A. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Feb 1995. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–694). Order Number DE95008748. Source: OSTI; NTIS; INIS; GPO Dep.

The stability of current-driven external-kink modes is investigated in a tokamak plasma surrounded by an external shell of finite electrical conductivity. According to conventional theory, the ideal mode can be stabilized by placing the shell sufficiently close to the plasma, but the non-rotating "resistive shell mode," which grows on the characteristic L/R time of the shell, always persists. It is demonstrated, using both analytic and numerical techniques, that a combination of strong edge plasma rotation and dissipation somewhere inside the plasma is capable of stabilizing the resistive shell mode. This stabilization mechanism does not necessarily depend on toroidicity or presence of resonant surfaces inside the plasma.

17149 (DOE/ET/53088–697) **Shear flow effects on ion thermal transport in tokamaks.** Tajima, T. (Univ. of Texas, Austin, TX (United States). Institute for Fusion Studies); Horton, W.; Dong, J.Q.; Kishimoto, Y. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Mar 1995. 41p. Sponsored by USDOE, Washington, DC (United States);Japan Atomic Energy Research Inst., Tokyo (Japan). DOE Contract FG05-80ET53088. (IFSR–697). Order Number DE95009115. Source: OSTI; NTIS; INIS; GPO Dep.

From various laboratory and numerical experiments, there is clear evidence that under certain conditions the presence of

sheared flows in a tokamak plasma can significantly reduce the ion thermal transport. In the presence of plasma fluctuations driven by the ion temperature gradient, the flows of energy and momentum parallel and perpendicular to the magnetic field are coupled with each other. This coupling manifests itself as significant off-diagonal coupling coefficients that give rise to new terms for anomalous transport. The authors derive from the gyrokinetic equation a set of velocity moment equations that describe the interaction among plasma turbulent fluctuations, the temperature gradient, the toroidal velocity shear, and the poloidal flow in a tokamak plasma. Four coupled equations for the amplitudes of the state variables radially extended over the transport region by toroidicity induced coupling are derived. The equations show bifurcations from the low confinement mode without sheared flows to high confinement mode with substantially reduced transport due to strong shear flows. Also discussed is the reduced version with three state variables. In the presence of sheared flows, the radially extended coupled toroidal modes driven by the ion temperature gradient disintegrate into smaller, less elongated vortices. Such a transition to smaller spatial correlation lengths changes the transport from Bohm-like to gyrobohm-like. The properties of these equations are analyzed. The conditions for the improved confined regime are obtained as a function of the momentum-energy deposition rates and profiles. The appearance of a transport barrier is a consequence of the present theory.

17150 (ENEA-RT-ERG-FUS–93-01) **Formation and evolution of wall protective plasma shield in hard disruption.** Sestero, A. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione). Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Jun 1993. 53p. (RT/ERG-FUS–93-01). Order Number DE95771029. Source: OSTI; NTIS (US Sales Only).

The behaviour of the material ablated from the wall in a hard disruption is analyzed, in order mainly to ascertain its capability of protecting the wall from more severe damage. The investigation is limited to the fast first phase of the disruption, during which most of the bulk plasma thermal energy is spilled off. Within the ablated material an interaction region and a trasmission region are defined. The first region (the 'virtual limiter') is where the bulk plasma thermal energy is dumped, and the associated kinetic energy flux changed to radiation flux. The second region ('plasma shield') is where the radiative energy flux is significantly attenuated, being thus prevented from more seriously injuring the solid wall. The whole problem is investigated in terms of a simplified mathematical model, which is shown to have a similarity solution. By making further approximations, a solution is derived in full analytical terms. Applications are made to an Iter-type and to an Ignitor-type tokamaks.

17151 (ENEA-RT-ERG-FUS–93-12) **Electromagnetic forces on ITER first wall and blanket.** Ferrari, M. (ENEA, Frascati (Italy). Area Nucleare); Simbolotti, G.; Rubinacci, G.; Pellegrino, L. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Jun 1993. 50p. (CONF-9210503–1: Workshop on electromagnetic forces and related effects on blankets and other structures surrounding the plasma torus, Karlsruhe (Germany), 20-21 Oct 1992; RT/ERG-FUS–93-12). Order Number DE95771025. Source: OSTI; NTIS (US Sales Only).

In the tokamak fusion devices electromagnetic transients occur during normal and off-normal operation conditions (e.g. start-up, plasma disruption). As a consequence, eddy currents and related electrodynamic forces are induced in the conductive structures surrounding the plasma. The behaviour of the first wall/blanket system during plasma disruption events has been investigated within the framework of a study contract between ENEA (Italian Agency for New Technolgies, Energy and the Environment) and the University of Napoli. The analyses have been performed by using the CARIDDI finite element code, assuming the ITER (International Thermonuclear Experimental Reactor) plasma scenarios and geometry as a reference.

17152 (ENEA-RT-ERG-FUS–94-08) **Consistent determination of pressure/toroidal magnetic field profiles in Grad-Shafranov's equation.** Lo Surdo, C. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione). Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Oct 1994. 23p. (RT/ERG-FUS–94-08). Order Number DE95771035. Source: OSTI; NTIS (US Sales Only).

A dissipative model of a stationary, axisymmetric plasma configuration which allows to compute the pressure p and the toroidal magnetic field $B\phi$ as functions of the poloidal magnetic flux Ψ in Grad-Shafranov's equation is considered. This will be obtained through the solution of four coupled equations in the four unknowns p, $B\phi$, T (temperature) and Ψ.

17153 (ENEA-RT-ERG-FUS–94-11) **Experimental plasma equilibrium reconstruction from kinetic and magnetic measurements in FTU Tokamak.** Alladio, F. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Micozzi, P. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Jul 1994. 31p. (RT/ERG-FUS–94-11). Order Number DE95771034. Source: OSTI; NTIS (US Sales Only).

Behaviour of FTU tokamak plasma was analyzed using two reconstructive MHD equilibrium codes: the first code works by using the magnetic data alone and the second one by including as well the shape of the kinetic pressure profile, as obtained from the measured profiles of electron temperature T_e and density n_e. The code that analyzes the magnetic data alone provides a good evaluation of the macroscopic quantities such as poloidal beta B_p and internal inductance l_i, if the plasma elongation is greater than 1.04. No detailed information about the toroidal current density profile J_ϕ and the safety factor profile q can be obtained from the magnetic data alone. On the other hand, the coupling of magnetic and kinetic data is able to provide a reasonable estimate of the toroidal current density profile and of its behaviour during the plasma discharge. The reliability of the J_ϕ and q profiles reconstruction has been explored and validated by a detailed comparison with the observed MHD behaviour of the FTU plasma discharges. A good agreement between the apparence of the sawtooth activity and the drop of the safety factor on the magnetic axis qo to unity is observed. Also, at least for edge safety factors $q\psi$ less than four, the sawtooth inversion radius is found to be very close to the q=1 surface. A remarkable correspondence between $J\phi$ and $T_e^{3/2}$ is found in sawtoothing discharges. The structure of the snake oscillation in pellet injected discharges is found to be strictly correlated to the position of the q=1 surface. A cylindrical linear tearing mode stability calculation applied to the reconstructed $J\phi$ profile has shown qualitative agreement with the appearence of the Mirnov oscillations. Finally the magnetic reconnections between double resonant surfaces during the rise of the plasma current or after the pellet injection have provided an interesting validation of the $J\phi$ profile reconstruction.

17154 (ENEA-RT-ERG-FUS–94-12) **Exact and appoximate geometric calculations for toroidal D-shaped plasmas: Application to Ignitor-Ult.** Rollet, S. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Pedretti, E. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Jul 1994. 24p. (RT/ERG-FUS–94-12). Order Number DE95771027. Source: OSTI; NTIS (US Sales Only).

For a tiroidal D-shaped plasma, this paper presents exact formulas to calculate geometrical quantities of interest to plasma physicists and engineers. Each quantity (plasma cross section, volume, circumference and surface, including outboard and inboard fractions) can be expressed in the form $Q=Q_{circ}F_Q$, where Q is the quantity pertaining to the D-shaped plasma (characterized by major radius R_0, minor radii a, b and triangularity τ); Q_{circ} is the corresponding quantity for the circular plasma of parameteres R_0, a; and F_Q is an adimensional factor (only containing simple integrals) which depends on τ, on the elongation $\kappa=b/a$ and on the aspect ratio $A=R_0/a$. Besides giving exact formulas, it is proposed two approximating procedures, one graphical and one numerical. Within their validity limits ($0<=\tau<=1$, $1.4<=\kappa<=2.6$ and any A) the approximating formulas - only derived for plasma cross section, volume, circumference and surface - allow a quick determination of the quantities Q with an accuracy better than 1%. As an example, it is presented the results of calculations performed by exact formulas and by approximating procedures for the triangular plasma of the Ignitor-Ult tokamak.

17155 (ENEA-RT-ERG-FUS–94-16) **Linear and non-linear dynamics of Alfven Eigenmodes in Tokamaks.** Vlad, G. (ENEA,

Frascati (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute); Zonca, F.; Romanelli, F.; Kar, C. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia Ambiente e Salute. Aug 1994. 72p. (RT/ERG-FUS–94-16). Order Number DE95771032. Source: OSTI; NTIS (US Sales Only).

Linear and non-linear dynamics of various toroidicity induced global Alfven Eigenmodes is investigated by means of an initial value numerical code. The code uses the reduced magnetohydrodynamic (MHD) model expanded to the third order in the inverse aspect ratio parameter belonging to (belonging to$\equiv a/R_o$). Non-linear saturation is shown to occur due to the excitation of a perturbation to the non-linear mode structure, which dissipates energy on very short scales. In particular the non-linear saturation of the Toroidal Alfven Eigenmodes (TAE) and of the Resistive Periodic Shear Alfven Eigenmodes (RPSAE) due to MHD non-linearities is investigated and compared with analytical predictions.

17156 (ENEA-RT-ERG-FUS–94-19) **Contributions to 11. international conference on plasma surface interactions.** ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. 1994. 55p. (CONF-9405310–Exc.: 11. international conference on plasma surface interactions, Ibaraki-Ken (Japan), 23-27 May 1994; RT/ERG-FUS–94-19). Order Number DE95771047. Source: OSTI; NTIS (US Sales Only).

This paper contains the italian contributions to the 11. international conference on plasma surface interactions (Ibaraki-Ken, Japan, 23-27 May 1994).

17157 (ENEA-RT-ERG-FUS–94-19, pp. 5-16) **Energy deposition on the FTU poloidal limiter during disruptions.** Ciotti, M. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Franzoni, G.; Maddaluno, G. No corporate text available. Jul 1994. (CONF-9405310–Exc.: 11. international conference on plasma surface interactions, Ibaraki-Ken (Japan), 23-27 May 1994; RT/ERG-FUS–94-19). In *Contributions to 11.international conference on plasma surface interactions.* 55p. Order Number DE95771047. Source: OSTI; NTIS (US Sales Only).

The first results of the program for the characterization of the thermal flux on the FTU poloidal limiter during disruptions are presented. Data on power fluxes are obtained by using an infrared detector and a set of thermocouples. Two peaks in the limiter thermal load, corresponding to the thermal (up to 500 MW/m2) and magnetic quenches, are well resolved by the infrared detector allowing the time correlation with other first diagnostic measurements. The dependence on the main plasma parameters of the intensity and time evolution of the thermal flux to the limiter is discussed.

17158 (ENEA-RT-ERG-FUS–94-19, pp. 17-28) **Characterization of scrape off layer plasma in FTU tokamak.** Pericoli-Ridolfini, V. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Crisanti, F.; Mazzitelli, G.; Pieroni, L.; Romanelli, F.; Zagorski, R.; Granucci, G. No corporate text available. Jul 1994. (CONF-9405310–Exc.: 11. international conference on plasma surface interactions, Ibaraki-Ken (Japan), 23-27 May 1994; RT/ERG-FUS–94-19). In *Contributions to 11. international conference on plasma surface interactions.* 55p. Order Number DE95771047. Source: OSTI; NTIS (US Sales Only).

The average values of the scrape-off layer (SOL) plasma quantities of the FTU, density, temperature, e-folding lenghts, as well as the structure of their poloidal variation, are studied as a function of the macroscopic plasma parameters and are satisfactorily compared with 2D model predictions. An explanation is proposed for the poloidal asymmetries based on the variation of the magnetic line connection length. A self consistent model of the FTU plasma, 0D in the core and 1D in the SOL, can reproduce the main features of the impurity production and power radiation in FTU.

17159 (ENEA-RT-ERG-FUS–94-19, pp. 29-40) **Impurity production and screening in FTU.** Bartiromo, R. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Condrea, I.; De Angelis, R.; Leigheb, M. No corporate text available. Jul 1994. (CONF-9405310–Exc.: 11. international conference on plasma surface interactions, Ibaraki-Ken (Japan), 23-27 May 1994; RT/ERG-FUS–94-19). In *Contributions to 11. international conference on plasma surface interactions.* 55p. Order Number DE95771047. Source: OSTI; NTIS (US Sales Only).

The production and retention of metallic impurities in the FTU scrape off layer have been studied by inserting a Titanium target in the plasma periphery. Deuterium sputtering reasonably accounts for the impurities produced, while their retention in the SOL improves when the last closed magnetic surface is approched.

17160 (ENEA-RT-ERG-FUS–94-19, pp. 41-55) **Avanced study of impurity transport in ITER tokamak.** Zagorski, R. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). No corporate text available. Jul 1994. (CONF-9405310–Exc.: 11. international conference on plasma surface interactions, Ibaraki-Ken (Japan), 23-27 May 1994; RT/ERG-FUS–94-19). In *Contributions to 11. international conference on plasma surface interactions.* 55p. Order Number DE95771047. Source: OSTI; NTIS (US Sales Only).

The 2D-multifluid code EPIT has been used to study the problem of impurity production and transport in the ITER tokamak scrape-off layer (SOL). Calculations have been performed for beryllium, carbon and nickel target plates under the assumption that physical sputtering is the only mechanism of the impurity production. Results show that for the beryllium and carbon plates the plate erosion is high. In the case of carbon plates, up to 45% of the power flowing to the SOL can be radiated. For beryllium plates, impurity radiation is negligible. In the case of nickel, radiation is much stronger (up to 65%) and, simultaneously, impurity production much lower, while the impurity retention in the SOL improves. A simple 1D analytical model of the SOL is proposed in under to determine the dependence of the plasma parameters at the plate on the input energy, particle fluxes and the hydrogen recycling. A comparison between model predictions and code results is presented.

17161 (ENEA-RT-ERG-FUS–94-20) **Proposal for two colour interferometer for FTU.** Frigione, D. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Tudisco, O. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Nov 1994. 16p. (RT/ERG-FUS–94-20). Order Number DE95771024. Source: OSTI; NTIS (US Sales Only).

A proposal for setting up a two colour interferometer employing a CO_2 laser (lamda=10.6μm) compensated by a HeNe one to be installed on FTU Tokamak (Frascati Tokamak Upgrade) has presented. This instrument aims at measuring the plasma electron density in the high density regime (beyond 2.5 x $10^{20}m^{-3}$) and in presence of fast perturbations such as those induced by pellet injection. The proposed main wavelength makes the instrument almost insensitive to plasma refraction problems requiring, on the other side, another laser for compensating mechanical vibrations. The high beating frequency (40 MHz) between the probe beam and the reference beam, obtained by opto-acoustic modulators, should allow to follow rapid density variations. It is planned to set up a single channel probing the plasma along a vertical diameter of the poloidal cross section, to integrate the present density measurements and possibly be a prototype for a multi-channel system.

17162 (ENEA-RT-ERG-FUS–94-22) **Characteristics of FTU scrape-off layer (SOL) determined by a simple 1-D model.** Ferro, C. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione). No corporate text available. Dec 1994. 22p. Sponsored by Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). (RT/ERG-FUS–94-22). Order Number DE95771048. Source: OSTI; NTIS (US Sales Only).

A simple 1-D model analytical model has been developed to determine the SOL characteristics from the parameters of the main plasma. The solutions are compared with FTU experimental data. The solutions fit quite well the experimental data and their trend. Moreover the model suggests the presence of a critical density related to the non isothermal power flux and the corresponding maximum power which can be safely removed by volumetric sinks. Differences between a limiter-like configuration and a divertor-like configuration are described.

17163 (ETDE-IT–95-16) **Self-consistent analysis of impurity dynamics on FTU-Tokamak.** Zagorski, R. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Romanelli, F.; Pieroni, L. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). 1995. 28p. Order Number DE95771052. Source: OSTI; NTIS (US Sales Only).

A self consistent treatment of the bulk and scrape-off layer plasma in the Frascati Tokamak Upgrade (FTU) is presented. The model is based on the 0-D description of the plasma transport in the tokamak centre and on the 1-D model of the SOL plasma dynamics. The FTU configuration with the poloidal inconel limiter is considered. Preliminary calculations for the configuration with the molybdenum and tungsten limiter phase are also presented. The comparison with the experimental data shows good agreement with the results of the model.

17164 (GA-A–21716) **Effects of particle fueling and plasma wall interactions on DIII-D discharges.** Jackson, G.L. (General Atomics, San Diego, CA (United States)); Baker, D.R.; Holtrop, K.L.; Staebler, G.M.; West, W.P.; Maingi, R.; Konoshima, S. General Atomics, San Diego, CA (United States). Nov 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-940580–26: 11. international conference on plasma surface interactions in controlled fusion devices, Mito (Japan), 23-27 May 1994). Order Number DE95009608. Source: OSTI; NTIS; INIS; GPO Dep.

DIII-D has successfully operated with an all-graphite first wall, including the first observations of VH-mode without boronization. A major goal of this, and other recent upgrades, was to control impurity influxes and hydrogenic fueling. Graphite tiles were carefully pre-conditioned, first by ex situ preparation and then by baking and helium glow conditioning. No deuterium or hydrogen was used until tokamak operation commenced. With the all graphite wall, both impurity and deuterium influxes during tokamak discharges were lower than previous boronized discharges; central nickel impurity line radiation, NiXXV and NiXXVI, was an order of magnitude lower than previous discharges during the ELM free beam heated phase. The effect of reduced particle fueling on plasma performance, particularly H- and VH-mode discharges, will be presented.

17165 (GA-A–21793) **Stabilization of ballooning modes with sheared toroidal rotation.** Miller, R.L.; Waelbroeck, F.W.; Lao, L.L.; Taylor, T.S. General Atomics, San Diego, CA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-92ER54150. (CONF-940933–36: 15. international conference on plasma physics and controlled nuclear fusion research, Madrid (Spain), 26 Sep - 1 oct 1994). Order Number DE95008388. Source: OSTI; NTIS; INIS; GPO Dep.

A new code demonstrates the stabilization of MHD ballooning modes by sheared toroidal rotation. A shifted-circle model is used to elucidate the physics and numerically reconstructed equilibria are used to analyze DIII-D discharges. In the ballooning representation, the modes shift periodically along the field line to the next point of unfavorable curvature. The shift frequency ($d\Omega/dq$ where Ω is the angular toroidal velocity and q is the safety factor) is proportional to the rotation shear and inversely proportional to the magnetic shear. Stability improves with increasing shift frequency and, in the shifted circle model, direct stable access to the second stability regime occurs when this frequency is a fraction of the Alfven frequency $\omega_A = V_A/qR$. Shear stabilization is also demonstrated for an equilibrium reconstruction of a DIII-D VH-mode.

17166 (GA-A–21914) **"/all stabilization of high beta plasmas in DIII-D.** Taylor, T.S. (General Atomics, San Diego, CA (United States)); Strait, E.J.; Lao, L.L.; Turnbull, A.D.; Burrell, K.H.; Chu, M.S.; Ferron, J.R.; Groebner, R.J.; La Haye, R.J.; Mauel, M. General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States); Lawrence Livermore National Lab., CA (United States). Feb 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; AC05-84OR21400 ; W-7405-ENG-48. (CONF-941101–9: Meeting of the Division of Plasma Physics of the American Physical Society, Minneapolis, MN (United States), 7-11 Nov 1994). Order Number DE95009607. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed analysis of recent high beta discharges in the DIII-D tokamak demonstrates that the resistive vacuum vessel can provide stabilization of low n magnetohydrodynamic (MHD) modes. The experimental beta values reaching up to $\beta_T = 12.6\%$ are more than 30% larger than the maximum stable beta calculated with no wall stabilization. Plasma rotation is essential for stabilization. When the plasma rotation slows sufficiently, unstable modes with the characteristics of the predicted "resistive wall" mode are observed. Through slowing of the plasma rotation between the q = 2 and q = 3 surfaces with the application of a non-axisymmetric field, the authors have determined that the rotation at the outer rational surfaces is most important, and that the critical rotation frequency is of the order of $\Omega/2\pi = 1$ kHz.

17167 (GA-A–21926) **Development of a tokamak plasma optimized for stability and confinement.** Politzer, P.A. General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States); Lawrence Livermore National Lab., CA (United States). Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; AC05-84OR21400 ; W-7405-ENG-48. (CONF-941182–3: 6. international Toki conference on plasma physics and controlled nuclear fusion: Research for advanced concepts in magnetic fusion, Toki-city (Japan), 29 Nov - 2 dec 1994). Order Number DE95009609. Source: OSTI; NTIS; INIS; GPO Dep.

Design of an economically attractive tokamak fusion reactor depends on producing steady-state plasma operation with simultaneous high energy density (β) and high energy confinement (τ_E); either of these, by itself, is insufficient. In operation of the DIII-D tokamak, both high confinement enhancement ($H \equiv \tau_E/\tau_{ITER-89P} = 4$) and high normalized β ($\beta_N \equiv \beta/(I/aB) = 6\%$-m-T/MA) have been obtained. For the present, these conditions have been produced separately and in transient discharges. The DIII-D advanced tokamak development program is directed toward developing an understanding of the characteristics which lead to high stability and confinement, and to use that understanding to demonstrate stationary, high performance operation through active control of the plasma shape and profiles. The authors have identified some of the features of the operating modes in DIII-D that contribute to better performance. These are control of the plasma shape, control of both bulk plasma rotation and shear in the rotation and Er profiles, and particularly control of the toroidal current profiles. In order to guide their future experiments, they are developing optimized scenarios based on their anticipated plasma control capabilities, particularly using fast wave current drive (on-axis) and electron cyclotron current drive (off-axis). The most highly developed model is the second-stable core VH-mode, which has a reversed magnetic shear safety factor profile [$q(O) = 3.9$, $q_{min} = 2.6$, and $q_{95} = 6$]. This model plasma uses profiles which the authors expect to be realizable. At $\beta_N \geq 6$, it is stable to n=l kink modes and ideal ballooning modes, and is expected to reach $H \geq 3$ with VH-mode-like confinement.

17168 (IC–95/31) **"Heavy light bullets" in electron-positron plasma.** Berezhiani, V.I.; Mahajan, S.M. International Centre for Theoretical Physics, Trieste (Italy). Mar 1995. 42p. Order Number DE95628408. Source: OSTI; NTIS (US Sales Only); INIS.

The nonlinear propagation of circularly polarized electromagnetic waves with relativistically strong amplitudes in an unmagnetized hot electron-positron plasma with a small fraction of ions is investigated. The possibility of finding localized solutions in such a plasma is explored. It is shown that these plasmas support the propagation of "heavy light bullets"; nondiffracting and nondispersive electromagnetic (EM) pulses with large density bunching. (author). 24 refs, 12 figs.

17169 (INIS-JP–028, pp. 82-84) **Experimental studies on the plasma-driven permeation of deuterium through nickel under plasmas.** Kodama, Kouta (Kyoto Univ. (Japan). Faculty of Engineering); Tanaka, Toshiyuki; Takagi, Ikuji; Fujita, Haruyuki; Shin, Kazuo; Higashi, Kunio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Plasma-driven permeation (PDP) of deuterium through nickel membrane at the non-steady state were experimentally studied using a small rf-plasma device. When the sample was exposed to the deuterium plasma for a short time, the maximum permeation rate of the PDP at the non-steady state increased almost linearly with the exposure time. The evolution curves of the permeation flux could be well reproduced by numerical calculations. (author).

17170 (INIS-JP–040) **Aiming at nuclear fusion reactors. Present status of nuclear fusion research and development in JAERI.** Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment. Nov 1994. 91p. (In Japanese). Order Number DE95768258. Source: OSTI; NTIS; INIS.

Nuclear fusion is expected as the ultimate method of stably supplying energy which is the motive power of the durable development of civilized society coping with the increase of world population and the accompanying increase of energy consumption. The fuel and material resources required for nuclear fusion are not distributed unevenly in the world, and exist inexhaustibly in reality. Nuclear fusion reaction stops immediately when fuel supply is stopped, therefore, it has high safety in principle. Helium which is produced as the result of nuclear fusion is the harmless gas without radiation emission. The effect that the neutrons generated simultaneously exert to global environment weakens quickly. As for the research on nuclear fusion, the condition of critical plasma was attained with tokamaks, and the control of plasma has progressed. Also the technologies including superconducting magnets have advanced. The international project of ITER design is in progress. In this book, nuclear fusion and tokamaks, the concept of nuclear fusion reactors and ITER project, the confinement of plasma, the device of the component machinery and equipment, the basic research and the development of hereafter are described. (K.I.).

17171 (INIS-mf–14483, pp. 9-12) **Characteristics of z-pinch plasma implosion.** Kubes, P. (Ceske Vysoke Uceni Technicke, Prague (Czech Republic). Fakulta Elektrotechnicka); Hakr, J.; Kravarik, J.; Kulhanek, P.; Pichal, J. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Some results are presented of Schlieren and interferometric diagnostics of the high current discharge (0.5 kJ, 50 kA, T≈2 μs) between two cone-shaped electrodes in nitrogen and argon (pressure 2-50 kPa). The pulse length of the diagnostic laser was 40 ns. The plasma was accelerated due to the Lorentz force in a radial direction towards the discharge symmetry axis, and two parts - plasma jets and a relatively long-living plasma structure - were produced. The characteristics and parameters of this structure may be described using magnetohydrodynamic turbulence phenomena. 6 refs.

17172 (INIS-mf–14483, pp. 150) **Reflectometry at CASTOR tokamak.** Kletecka, P. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MICROWAVE RADIATION/reflection; PLASMA DIAGNOSTICS/microwave radiation; CASTOR TOKAMAK; GHZ RANGE 01-100; HOT PLASMA; REFLECTION; PLASMA DENSITY

17173 (INIS-mf–14483, pp. 150) **Calculation of correlation dimension of plasma density fluctuations in CASTOR tokamak.** Holakovsky, J. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu); Petrzilka, J.; Stoeckel, J. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLASMA DENSITY/fluctuations; CASTOR TOKAMAK; CORRELATIONS; DEGREES OF FREEDOM; ENERGY LOSSES; HOT PLASMA; FLUCTUATIONS

17174 (INIS-mf–14483, pp. 151) **Tomography at CASTOR tokamak.** Mlynar, J. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu); Badalec, J. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLASMA DIAGNOSTICS/computerized tomography; BALMER LINES; CASTOR TOKAMAK; CHARGE-COUPLED DEVICES; SEMICONDUCTOR DETECTORS; VISIBLE RADIATION

17175 (INIS-mf–14483, pp. 152) **Plasma relaxation in flowing afterglow at medium pressures.** Zakouril, P. (Karlova Univ., Prague (Czech Republic). Fakulta Matematicko-Fyzikalni); Glosik, J.; Skalsky, V.; Hanzal, V. Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AFTERGLOW/plasma diagnostics; AFTERGLOW; ARGON; HELIUM; LANGMUIR PROBE; LOW PRESSURE; MASS SPECTROSCOPY

17176 (INIS-mf–14483, pp. 152) **Study of boundary plasma in CASTOR tokamak.** Zacek, F. (Ceska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CASTOR TOKAMAK/fluctuations; CASTOR TOKAMAK/turbulence; FLUCTUATIONS; TURBULENCE; CHARGED-PARTICLE TRANSPORT; CONFINEMENT TIME; LOWER HYBRID CURRENT DRIVE; PLASMA; PLASMA CONFINEMENT

17177 (INIS-mf–14483, pp. 161) **Plasma diagnostics by holographic interferometry.** Kovar, L. (Vysoke Uceni Technicke, Brno (Czech Republic)). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). In *Proceedings of the 11. conference of Czech and Slovak physicists.* Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLASMA DIAGNOSTICS/mach-zehnder interferometer; COLLISIONAL PLASMA; ELECTRIC ARCS; HOLOGRAPHY; INTERFEROMETRY

17178 (JAERI-Conf–94-004, pp. 169-171) **Measurement of time-dependent spatial deuterium in a tokamak scrape-off layer.** Nakajima, Tadashi (Kobe Univ. of Mercantile Marine

(Japan)). Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1994. (CONF-9403189–: 1993 workshop on particle-material interactions for fusion, Tokai (Japan), 8-9 Mar 1994). In *Report of the 1993 workshop on particle-material interactions for fusion.* 195p. Order Number DE95737282. Source: OSTI; NTIS; INIS.

The recycling of fuel and impurity particles in the scrape-off layer (SOL) of a tokamak is important for effective magnetic confinement. This phenomenon is closely associated with the transport process of these particles in the SOL. Hence we attempted to measure the time-dependent spatial flux distribution with an emphasis on fuel (deuterium) in the SOL of a tokamakf (JFT-2M). Recently a rotatable collector probe was installed at the surface station of the JFT-2M. A preliminary test showed a good performance in operating the probe system for the study on time behavior of particles. (J.P.N.).

17179 (JAERI-Review–94-011) **Annual report of Naka Fusion Research Establishment for the period from April 1, 1993 to March 31, 1994.** Matoba, Tohru (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Nakamura, Yukiharu; Matsuzaki, Yoshimi; Araki, Masanori; Yamane, Yoshifumi (eds.). Japan Atomic Energy Research Inst., Tokyo (Japan). Jan 1995. 134p. Order Number DE95768202. Source: OSTI; NTIS; INIS.

Research and development activities at Naka Fusion Research Establishment, JAERI, are reported for the period from April 1, 1993 to March 31, 1994. The main objectives of JT-60U experiments in FY1993 were to achieve and sustain high confinement regime with current drive. The JFT-2M experiments progressed in the systematic study of the plasma responses by applying an external helical field and also in the study of the boundary plasma with electric field or current in the scrape off layer (SOL) introduced by the divertor bias system. The study in Plasma Theory and Computation focused on the ion temperature gradient instability, the linear toroidal particle simulation, the MHD stability and the analyses of burning plasma. The progresses on DIII-D experiments were obtained in the studies of divertor radiation, cryopumping and VH-mode plasma. As for the fusion engineering research, further developments of a ceramic vacuum pump and a high-resolution quadrupole mass spectrometer (QMS) were made. A high energy H^- beam of 400keV and 0.18A was produced with a current density of 13mA/cm^2 for 1s. Many efforts were made in developing the long pulse gyrotron and the high efficiency collector potential depression (CPD) gyrotron in the radio-frequency (RF) technology area. The main progress in the Tritium Systems Test Assembly (under US/Japan collaboration) was to demonstrate the plasma exhaust stream under non-steady tokamak operation. Heating experiments of the development 1m long divertor module for ITER were performed at a heat flux of 15MW/m^2 for 30sec. The R and D of the reactor structure were focused on the major components such as non-circular bellows, fail-safe first wall, etc.. The R and D of the blanket technology were focussed on the box structure for ITER shielding blanket and the out-of-reactor testing of ITER breeding blanket. (J.P.N.).

17180 (JINR-E–11-90-204, pp. 58) **Automation of numerical solution of PDE systems.** Liska, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PLASMA WAVES/numerical solution; FOKKER-PLANCK EQUATION; R CODES; SCHROEDINGER EQUATION

17181 (KTH-ALF-R–94-3) **Induced surface current effects on a magnetized plasma surrounded by a conducting wall.** Lehnert, B. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Fusion Plasma Physics. Oct 1994. 29p. Order Number DE95629063. Source: OSTI; NTIS; INIS.

An earlier analysis of induced surface current effects on free-boundary modes of a magnetically confined plasma is extended to the case where the plasma is surrounded by a conducting wall. Two types of induced surface currents can then be identified. The first is due to the inhomogeneity of an externally imposed magnetic field part, and it exists also in absence of a conducting wall. The second is caused by compression or expansion of the magnetic field in the plasma-wall spacing. An analysis is further presented in which the plasma boundary condition and the induced surface currents become basic concepts in the formulation of the energy principle. A discussion of and comparison with the conventional extended energy principle is performed in which questionable points of the latter are being identified. 9 refs, 5 figs.

17182 (KTH-ALF-R–95-1) **Numerical solution of linearized resistive MHD equations in a cylindrical geometry.** Li, Jin. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Fusion Plasma Physics. 1995. 35p. Order Number DE95629064. Source: OSTI; NTIS; INIS.

Linearized resistive MHD eigenequations in a cylindrical geometry are derived and numerical methods are presented. The eigenequations are solved in a global manner such that there is no need to distinguish inner resistive layer and outer ideal region analytically. Resistive layer is numerically treated by using non-uniform mesh grid technique and high accuracy discretization scheme. Lundquist number S up to 10^9 can be easily achieved. Numerical results are benchmarked by known analytical solutions and other numerical methods. 6 refs, 5 figs.

17183 (KTH-ALF-R–95-2) **Over-relaxation phenomena during the set-up of RFP plasmas.** Nordlund, P.; Mazur, S. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Fusion Plasma Physics. Mar 1995. 18p. Order Number DE95629065. Source: OSTI; NTIS; INIS.

Experiments on the Extrap T1 reversed field pinch have shown that the formation of the RFP configuration is quite sensitive to the relative programming of the toroidal field and ohmic heating circuits. In this paper, new measurements of the evolution of the current density profile and of the spectral structure of the fluctuations during the set-up phase of RFP plasmas in the T1 experiment are presented. These measurements improve the understanding of the role of different spectral components in the dynamics of RFP formation. Under unfavourable (slow) set-up conditions, comparatively high energy is accumulated in m = 1 internal kinks prior to reversal of the edge toroidal fields. At reversal, nonlinearly driven m = 0 modes trigger a rapid broadening of the m = 1 spectrum. This behaviour is associated with a violent suppression of the current density in the core leading to an over-relaxation of the discharge involving a hollowing of the parallel current density profile. The over-relaxation phenomenon increases the volt-second consumption and plasma/wall interaction during RFP set-up, and degrades the flat-top discharge performance. 15 refs, 5 figs, 1 tab.

17184 (PPPL–3063) **Measurement of loss of DT fusion products using scintillator detectors in TFTR.** Darrow, D.S. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Herrmann, H.W.; Johnson, D.W.; Marsala, R.J.; Palladino, R.W.; Zweben, S.J.; Tuszewski, M. Princeton Univ., NJ (United States). Plasma Physics Lab. Mar 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-940552–38: 10. topical conference on high-temperature plasma diagnostics, Rochester, NY (United States), 8-12 May 1994). Order Number DE95008711. Source: OSTI; NTIS; INIS; GPO Dep.

A poloidal array of MeV ion loss probes previously used to measure DD fusion product loss has been upgraded to measure the loss of alpha particles from DT plasmas in TFTR. The following improvements to the system have been made in preparation for the use of tritium in TFTR: (1) relocation of detectors to a neutron-shielded enclosure in the basement to reduce neutron-induced background signals; (2) replacement of ZnS:Cu (P31) scintillators in the probes with the $Y_3Al_5O_{12}$:Ce(P46) variety to minimize damage and assure linearity at the fluxes anticipated from DT plasmas; and (3) shielding of the fiber optic bundles which carry the fight from the probes to the detectors to reduce neutron- and gamma-induced light within them. In addition to the above preparations, the probes have been absolutely calibrated for alpha particles by using the Van de Graaf accelerator at Los Alamos National Laboratory. Alpha particle losses from DT plasmas have been observed, and

losses at the detector 901 below the midplane are consistent with first orbit loss.

17185 (PPPL–3091) **High harmonic fast waves in high beta plasmas.** Ono, Masayuki. Princeton Univ., NJ (United States). Plasma Physics Lab. Apr 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95009852. Source: OSTI; NTIS; INIS; GPO Dep.

High harmonic fast magnetosonic wave in high beta/high dielectric plasmas is investigated. including the finite-Larmor-radius effects. In this regime, due to the combination of group velocity slow down and the high beta enhancement, the electron absorption via electron Landau and electron magnetic pumping becomes significant enough that one can expect a strong ($\sim$ 100%) single pass absorption. By controlling the wave spectrum, the prospect of some localized electron heating and current drive appears to be feasible in high beta low-aspect-ratio tokamak regimes. Inclusion of finite-Larmor-radius terms shows an accessibility limit in the high ion beta regime (β_i = 50% for a deuterium plasma) due to mode-conversion into an ion Bernstein-wave-like mode while no beta limit is expected for electrons. With increasing ion beta, the ion damping can increase significantly particularly near the beta limits. The presence of energetic ion component expected during intense NBI and α-heating does not appear to modify the accessibility condition nor cause excessive wave absorption.

17186 (PPPL–3092) **Comparison of the calculations of the stability properties of a specific stellarator equilibrium with different MHD stability codes.** Nakamura, Y. (Kyoto Univ. (Japan). Plasma Physics Lab.); Matsumoto, T.; Wakatani, M.; Galkin, S.A.; Drozdov, V.V.; Martynov, A.A.; Poshekhonov, Yu.Yu.; Ichiguchi, K.; Garcia, L.; Carreras, B.A. Princeton Univ., NJ (United States). Plasma Physics Lab. Apr 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95009851. Source: OSTI; NTIS; INIS; GPO Dep.

A particular configuration of the LHD stellarator with an unusually flat pressure profile has been chosen to be a test case for comparison of the MHD stability property predictions of different three-dimensional and averaged codes for the purpose of code comparison and validation. In particular, two relatively localized instabilities, the fastest growing modes with toroidal mode number n = 2 and n = 3 were studied using several different codes, with the good agreement that has been found providing justification for the use of any of them for equilibria of the type considered.

17187 (PPPL–3093) **Trapped ion mode in toroidally rotating plasmas.** Artun, M.; Tang, W.M.; Rewoldt, G. Princeton Univ., NJ (United States). Plasma Physics Lab. Apr 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95009854. Source: OSTI; NTIS; INIS; GPO Dep.

The influence of radially sheared toroidal flows on the Trapped Ion Mode (TIM) is investigated using a two-dimensional eigenmode code. These radially extended toroidal microinstabilities could significantly influence the interpretation of confinement scaling trends and associated fluctuation properties observed in recent tokamak experiments. In the present analysis, the electrostatic drift kinetic equation is obtained from the general nonlinear gyrokinetic equation in rotating plasmas. In the long perpendicular wavelength limit $k_\tau \rho_{bi} \ll 1$. where ρ_{bi} is the average trapped-ion banana width, the resulting eigenmode equation becomes a coupled system of second order differential equations nmo for the poloidal harmonics. These equations are solved using finite element methods. Numerical results from the analysis of low and medium toroidal mode number instabilities are presented using representative TFTR L-mode input parameters. To illustrate the effects of mode coupling, a case is presented where the poloidal mode coupling is suppressed. The influence of toroidal rotation on a TFTR L-mode shot is also analyzed by including a beam species with considerable larger temperature. A discussion of the numerical results is presented.

17188 (PPPL–3094) **Rapid guiding center calculations.** White, R.B. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Boozer, A.H. Princeton Univ., NJ (United States). Plasma Physics Lab. Apr 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95009853. Source: OSTI; NTIS; INIS; GPO Dep.

Premature loss of high energy particles, and in particular fusion alpha particles, is very deleterious in a fusion reactor. Because of this it is necessary to make long-time simulations, on the order of the alpha particle slowing down time, with a number of test particles sufficient to give predictions with reasonable statistical accuracy. Furthermore it is desirable to do this for a large number of equilibria with different characteristic magnetic field ripple, to best optimize engineering designs. In addition, modification of the particle distribution due to magnetohydrodynamic (MHD) modes such as the saw tooth mode present in the plasma can be important, and this effect requires additional simulation. Thus the large number of necessary simulations means any increase of computing speed in guiding center codes is an important improvement in predictive capability. Previous guiding center codes using numerical equilibria such as ORBIT evaluated the local field strength and ripple magnitude using Lagrangian interpolation on a grid. Evaluation of these quantities four times per time step (using a fourth order Runge-Kutta routine) constitutes the major computational effort of the code. In the present work the authors represent the field quantities through an expansion in terms of pseudo-cartesian coordinates formed from the magnetic coordinates. The simplicity of the representation gives four important advantages over previous methods.

17189 (UCRL-CR–115743) **Monthly report to LLNL from the Budker INP. Novosibirsk, September, 1992.** Ivanov, A.A.; Kotelnikov, I.A. Lawrence Livermore National Lab., CA (United States). Sep 1992. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009528. Source: OSTI; NTIS; GPO Dep.

The experiments on a plasma equilibrium response to externally applied disturbance of the magnetic field of a dipole type have been done on the GDT facility. The disturbance was produced by a pair of the coils installed at the end tank so as it was localized in the expander region. The results were compared with the theoretical predictions based on a hydromagnetic model of plasma equilibrium in the magnetic field treated in a long thin approximation. It was found that the measured displacements of the plasma column from a geometrical axis of the device varies linearly with the current in the disturbing coils at least up to 5cm at the midplane. The data was processed to subtract the displacement measured for zero current that apparently caused by a small disturbance of the magnetic field by soft-iron-made parts of the equipment placed near the device inside the experimental hall and, in part, also by misalignments of the main coils. Theoretically predicted slope of the displacement-field amplitude dependence is to be inversely proportional to a pressure-weighted curvature averaged along the device. The authors believe this allows the use of the data for the measurements of this value. The slopes have been calculated for the GDT parameters under different assumptions on Kp parameter that define an upper limit of integration of the pressure-weighted curvature in the near-end wall region in the expanders.

17190 (UTNL-R–0302, pp. 91-101) **Electromagnetic and structural interaction analysis of curved shell structures.** Horie, T. (Kyushu Inst. of Tech., Kitakyushu, Fukuoka (Japan)); Niho, T. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (In Japanese). (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

This paper describes a finite element formulation of the eddy current and structure coupled problem for curved shell structures. Coupling terms produced by curved geometry as well as flat plate geometry were obtained. Both matrix equations for eddy current and structure were solved simultaneously using coupling submatrices. TEAM Workshop bench mark problem 16 was solved to verify the formulation and the computer code. Agreement with experimental results was very good for such plate problem. A coupled problem for cylindrical shell structure was also analyzed. Influence of each coupling term was examined. The next topic is

the eigenvalues of the coupled equations. Although the coupled matrix equations are not symmetric, symmetry was obtained by introducing a symmetrizing variable. The eigenvalues of the coupled matrix equations are different from those obtained from the uncoupled equations because of the influence of the coupling sub-matrix components. Some parameters obtained by the eigenvalue analysis have characteristics of parameters which indicate the intensity of electromagnetic structural coupling effect. (author).

17191 (UTNL-R–0302, pp. 102-113) **Analyses of eddy currents and dynamic deflections of a thin shell structure with coupling effects.** Niikura, Setsuo (Mitsubishi Atomic Power Industries, Inc., Tokyo (Japan)); Kushiyama, Masuko. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

Analyses for coupled problems between eddy currents and dynamic deflections of a thin shell structure are presented. The eddy currents are solved by the integral method (the finite element circuit method) and the deflections are solved by the finite element method with coupling effects. The electromotive force due to the deflection is considered by moving the coordinates of the discretized nodes according to the results of the deflection analyses in the Lagrangian coordinate system. The present model is based on the assumptions that the conductor is thin and the structural deflection is small. An arbitrary shaped shell structure can be analyzed by the numerical analysis code (EDDYCUFF) on which the above mentioned method is implemented. In order to verify the method, the TEAM problems 12 and 16 are calculated by EDDYCUFF. The time evolutions of the calculated eddy currents and deflections of the plate are presented and compared with the experimental results. Eddy current and electromagnetic force distributions and a deformation of the plate are shown. The calculated results agree with the experimental results and show the validity and applicability of this method. For an example of divertor plates in a fusion device, we consider the rectangular stainless steel plate simply supported at both ends. The plate is placed under a transient magnetic field and a static magnetic field. The calculated results of the plate deflections show that the electromagnetic damping effect becomes distinguished when the strength of the static field is large or the plate thickness is thin. In conclusion, we presented the method and results of the analyses for coupled problems between eddy currents and dynamic deflections of a thin shell structure. The importance of the analyses of eddy currents and dynamic deflections with coupling effects in a fusion device design was shown. (author).

17192 (UTNL-R–0302, pp. 114-140) **Experimental and numerical analysis for magnetically induced vibrations of conducting structure.** Nishio, Satoshi (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Nakahira, Masataka; Miura, H.; Isono, A. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

The coupling effect between the electromagnetic field and mechanical response of a conducting structure is of importance in magnetic fusion devices as tokamak machine. The electromagnetically induced motion of the structure due to the Lorentz force induces additional eddy currents and further modifies the dynamic characteristics of the system. This paper is concerned with numerical modeling of the dynamic field-structure interaction and its verification by experimental tests. Here, a finite element numerical model for mechanical deformation and a wiregrid numerical model for eddy currents are employed for non-ferrous and elastic conductors. A computer code has been developed for 3-D thin shell structure. Experimental tests for the code verification were carried out by using a rectangular thin copper plate. Three kinds of the plate supporting systems, i.e., a cantilever system, a fixed both ends system and a simply supported ends system were investigated. A good agreement between the numerical and experimental results was obtained. Therefore, the computer code developed here is available for analyzing the electromagnetomechanical behavior of the plasma facing components of the tokamak device. (author).

17193 (UTNL-R–0302, pp. 141-148) **Magnetoelastic coupled vibration of first wall with magnetic damping.** Yoshida, Y. (Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.); Demachi, K.; Miya, K. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

Magnetoelastic coupled vibration of the ITER first wall during plasma disruption was computed taking the magnetic damping effect into account. It was found that a conventional numerical method without consideration of the damping effect significantly overestimates the dynamic stress induced at the first wall. The magnetic damping reduces dynamic stress in case of the thin first wall so that the flexible thin shell structure is applicable to fusion reactor components. (author).

17194 (UTNL-R–0302, pp. 178-188) **A large deformation theory of solids subject to electromagnetic loads and its application.** Nishiguchi, I. (Kanagawa Inst. of Tech., Atsugi (Japan)); Sasaki, M. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

A large deformation theory of deformable solids is proposed in which the interaction with electromagnetic fields is taken into account. Weak forms of the Maxwell's equations in a fixed reference configuration together with the balance of momentum constitute the governing equations for our theory. The weak forms of the Maxwell's equations in a reference configuration can be derived by the direct transformation from spatial weak forms. The results coincide with the weak forms obtained from the local expressions by Lax and Nelson though we made a distinction between the covariant and contravariant vector explicitly. For the deformable body subject to the electromagnetic fields, weak forms of the Ampere's law and/or the Faraday's law, when combined with the weak form of the balance of momentum, can serve as the governing equations of the theory. As is known, however, these equations are not sufficient to describe the response of a specific material due to a given loading. As for the momentum balance, we need the dependency of stress on the deformation and objective constitutive equations of hyperelasticity, hypoelasticity and inelasticity are available. Parallel to these, objective constitutive equations for the electromagnetism are discussed. As an application of the theory, linearized equations for quasi-static deformation under magnetic field is derived based on the vector potential formulation. (author).

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Refer also to citation(s) 15455, 15835, 16353, 16473, 16777, 16887, 16925, 17022, 17146, 17170, 17179, 17193

17195 (ANL/FPP/TM–278) **Development of aluminum nitride insulator coatings for fusion reactor applications.** Natesan, K. (Argonne National Lab., IL (United States). Energy Technology Div.). Argonne National Lab., IL (United States). Jan 1995. 52p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract W-31109-ENG-38. (ITER/US–95/IV-BL-03). Order Number DE95010211. Source: OSTI; NTIS; INIS; GPO Dep.

The blanket system is one of the most important components in a fusion reactor because it has a major impact on both the economics and safety of fusion energy. The primary functions of the blanket in a deuterium/tritium-fueled fusion reactor are to convert the fusion energy into sensible heat and to breed tritium for the fuel cycle. The Blanket Comparison and Selection Study, conducted earlier, described the overall comparative performance of various concepts, including liquid metal, molten salt, water, and helium. This report discusses the requirements of the International Thermonuclear Experimental Reactor for a self-cooled blanket that uses liquid Li and for indirectly cooled blankets that use other alkali metals such as NaK. The report discusses the requirements for an electrically insulating coating on the first-wall structural material to minimize the MHD pressure drop during the flow of liquid metal in a magnetic field. The report addresses the thermodynamics of interactions between the liquid metals (e.g., Li and NaK) and structural materials (e.g., V-base alloys and Type 316 stainless steel) and the AlN candidate electrical insulator coating, together with associated corrosion/compatibility issues. Details are presented on the AlN coating fabrication methods, and experimental data are reported for microstructures, pretreatment of the substrate, and heat treatment of coatings, coating/substrate and coating/lithium interactions, and electrical resistance before and after exposure to lithium.

17196 (ANL/FPP/TM–280) **Summary report for ITER Task - T226B: Evaluation of ITER disruption erosion.** Hassanein, A. Argonne National Lab., IL (United States). Feb 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95010402. Source: OSTI; NTIS; INIS; GPO Dep.

The behavior of divertor materials during a major disruption in a tokamak reactor is very important to successful and reliable operation of the device. Erosion of material surfaces due to a thermal energy dump can severely limit the lifetimes of plasma-facing components and thus diminish the reactor's economic feasibility. A comprehensive numerical model has been developed and used in this analysis, which includes all major physical processes taking place during plasma/material interactions. Models to account for material thermal evolution, plasma/vapor interaction physics, and models for hydrodynamic radiation transport in the developed vapor cloud above the exposed surface are implemented in a self-consistent manner to realistically assess disruption damage. The extent of self-protection from the developed vapor cloud in front of the incoming plasma particles is critically important in determining the overall disruption lifetime. Models to study detailed effects of the strong magnetic field on the behavior of the vapor cloud and on the net erosion rate have also been developed and analyzed. Candidate materials such as beryllium and carbon are considered in this analysis. The dependence of divertor disruption lifetime on disruption physics and reactor conditions is analyzed and discussed. In addition, material erosion from melting of plasma-facing components during a tokamak disruption is also a serious problem that limits reactor operation and economical reactor lifetime. In particular, metallic low-Z components such as Be will be subjected to severe melting during disruptions and edge localized modes (ELMs). Loss of the developed melt layer will critically shorten the lifetime of these components, severely contaminate the plasma, and seriously inhibit successful and reliable operation of the reactor. In this study mechanisms responsible for melt-layer loss during a disruption are also modeled and evaluated.

17197 (CONF-950232–30) **Remote maintenance challenges presented in the ITER engineering design.** Burgess, T.W.; Herndon, J.N.; Schrock, S.L.; Lousteau, D.C. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95006392. Source: OSTI; NTIS; INIS; GPO Dep.

Leading fusion energy research institutions are currently engaged in the Engineering Design Activity for the International Thermonuclear Experimental Reactor (ITER). A tokamak reactor design is evolving which emphasizes high system performance in a minimum overall reactor and building size. The resulting high component density dictates careful attention to ITER remote maintenance considerations in the development of the configuration. The complexity and scale of ITER remote maintenance tasks are well beyond the scope of today's experience and technology. This paper discusses the remote maintenance philosophy, describes the basic configuration as it relates to maintenance, and describes the basic procedures and equipment required. Key enabling technology research and development needs are also addressed.

17198 (DOE/ER–0313/16, pp. 3-7) **Status of U.S./Japan Collaborative Program Phase II HFIR target and RB* capsules.** Pawel, J.E. (Oak Ridge National Lab., TN (United States)); Senn, R.L.; Longest, A.W.; Shiba, K. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Capsules HFIR-MFE-JP9 through 16 were installed in the High Flux Isotope Reactor (HFIR) target July 20, 1990 for irradiation beginning with HFIR fuel cycle 289. Of these eight target capsules, JP10, 11, 13, 16 accumulated 18 dpa and were removed from the reactor in September 1991. JP14 was removed from the reactor at the end of cycle 310 (September 1992) after achieving a peak dose of 34 dpa. Capsules JP9, 12, and 15 completed 35 cycles on April 1, 1994 and were removed from the target region. Each capsule had accumulated a peak dose of approximately 57 dpa. Three new capsules, HFIR-MFE-JP20, 21, and 22, have been designed to complete the original experiment matrix of the JP9 through JP16 series capsules. Irradiation began in December 1993 with the start of cycle 322. As of April 1, 1994 (end of cycle 324), each capsule had achieved approximately 4.9 dpa. The RB* experiments are the continuation of the ORR spectrally tailored experiments. In this stage, a hafnium liner is used to modify the spectrum to simulate fusion helium to displacements per atom (He/dpa) ratio in the austenitic steel specimens. Of the four capsules in this set, two (60J-1 and 330J-1) were disassembled during this reporting period after accumulating a peak dose in HFIR of 11 dpa. Two capsules (200J-1 and 400J-1) are in the reactor and have achieved of 5.5 dpa.

17199 (DOE/ER–0313/16, pp. 8-9) **The COBRA-1B irradiation experiment in EBR-II.** Tsai, H. (Argonne National Lab., IL (United States)); Hins, A.G.; Strain, R.V.; Smith, D.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the forthcoming COBRA-1B experiment in EBR-II is to evaluate the effects of fast neutron irradiation on the physical and mechanical properties of candidate fusion structural materials. Of special interest in this experiment will be ITER-relevant temperature and exposure for the test specimens. Approximately 50% of the irradiation test volume will be devoted to vanadium-alloy specimens. Design of the COBRA-1B irradiation experiment began in this reporting period and is in progress. The target reactor insertion date for COBRA-1B is September 1994. Technical and programmatic feasibility approval for the experiment has been granted by EBR-II Operations.

17200 (DOE/ER–0313/16, pp. 13-14) **Revised neutron dosimetry results for the MOTA-2A experiment in FFTF.** Greenwood, L.R. (Pacific Northwest Lab., Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Revised neutron fluence and damage values are reported for the MOTA-2A experiment in the Fast Flux Test Facility (FFTF). This revision corrects an error with processing of the $^{235}U(n,f)$ reaction. Net corrections are on the order of 5%.

17201 (DOE/ER–0313/16, pp. 15-20) **Reanalysis of neutron dosimetry for the MOTA-1A/1B experiments in FFTF.** Greenwood, L.R. (Pacific Northwest Lab., Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual*

progress report for the period ending March 31, 1994. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Neutron fluence and spectral measurements and radiation damage calculations have been revised for the MOTA-1A,1B experiments in the Fast Flux Test Facility (FFTF). The data were revised in order to correct for nuclear burnup effects for several of the radiometric monitors, thereby increasing the fluence and damage up to 20%, according to position in the MOTA assembly. The MOTA-1A experiment was irradiated from January 18, 1983 to October 23, 1983 for an exposure of 202.0 EFPD. MOTA-1B was irradiated from January 1, 1984 to April 23, 1984 for an exposure of 109.5 EFPD. Neutron fluence and dpa values are presented for both assemblies.

17202 (DOE/ER–0313/16, pp. 21-27) **Neutron dosimetry for the MOTA-2B experiment in FFTF.** Greenwood, L.R. (Pacific Northwest Lab., Richland, WA (United States)); Kellogg, L.S. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Neutron fluence and spectral measurements and radiation damage calculations are reported for the (Materials Open Test Assembly) MOTA-2B experiment in the Fast Flux Test Facility (FFTF). The irradiation was conducted from May 27, 1991, to March 19, 1992 for a total exposure of 203.3 EFPD (effective full-power days). The maximum fluence was about 9 x 10^{22} n/cm^2, 6 x 10^{22} above 0.1 MeV producing about 24 dpa in iron. Neutron fluence and radiation damage maps are presented for the entire MOTA assembly based on the analysis of ten neutron spectral measurements and fourteen additional flux gradient measurements.

17203 (DOE/ER–0313/16, pp. 28-32) **Neutron dosimetry for the MOTA-1C experiment in FFTF.** Greenwood, L.R. (Pacific Northwest Lab., Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Neutron fluence and spectral measurements and radiation damage calculations have been completed for the Materials Open Test Assembly (MOTA)-1C experiment in the Fast Flux Test Facility (FFTF). Although this irradiation was completed in 1985, the neutron dosimetry data were never analyzed. The MOTA-1C experiment was irradiated in cycles 5 and 6 from June 16, 1984 to June 24, 1985 for an exposure of 256.7 EFPD (effective full power days). The irradiation was conducted at 400 MW. Neutron fluence and dpa values are presented.

17204 (DOE/ER–0313/16, pp. 33-42) **Transmutations of elements under irradiation and its impact on alloys composition.** Gomes, I.C. (Argonne National Lab., IL (United States)); Smith, D.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

This study presents a comparison of nuclear transmutation rates for candidate fusion first wall/blanket structural materials in available fission test reactors with those produced in a typical fusion spectrum. The materials analyzed in this study include a vanadium alloy (V-4Cr-4Ti), a reduced activation martensitic steel (Fe-9Cr-2WVTa), a high conductivity copper alloy (Cu-Cr-Zr), and the SiC compound. The fission irradiation facilities considered include the EBR-II (Experimental Breeder Reactor) fast reactor, and two high flux mixed spectrum reactors, HFIR (High Flux Irradiation Reactor) and SM-3 (Russian reactor). The transmutation and dpa rates that occur in these test reactors are compared with the calculated transmutation and dpa rates characteristic of a D-T fusion first wall spectrum. In general, past work has shown that the displacement damage produced in these fission reactors can be correlated to displacement damage in a fusion spectrum; however, the generation of helium and hydrogen through threshold reactions [(n,xα) and (n,xp)] are much higher in a fusion spectrum. As shown in this study, the compositional changes for several candidate structural materials exposed to a fast fission reactor spectrum are very low, similar to those for a characteristic fusion spectrum. However, the relatively high thermalized spectrum of a mixed spectrum reactor produces transmutation rates quite different from the ones predicted for a fusion reactor, resulting in substantial differences in the final composition of several candidate alloys after relatively short irradiation time. As examples, the transmutation rates of W, Ta, V, Cu, among others, differ considerably when the irradiation is performed under a mixed spectrum reactor's and fusion first wall's spectrum. Fast reactors (EBR-II) provide the only possibility for obtaining high damage rates without producing significant compositional effects in vanadium alloys, ferritic steels and copper alloys.

17205 (DOE/ER–0313/16, pp. 43-46) **Calculations to determine the feasibility of using a boron carbide shield for spectral tailoring in the HFIR for vanadium alloy irradiation-R.** Lillie, R.A. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

A neutron transport calculation has been performed to determine the feasibility of creating a shielded facility in the Be reflector of the HFIR. It was found that the B_4C provides satisfactory spectral tailoring to reduce production of Cr below the tolerance limit for Cr in the original alloys. The shield would have to be replaced after eight cycles or 5 dpa, but the operations schedule for the HFIR makes it easier to replace the shield after seven cycles. Three shields would then have to be used in order to reach 10 dpa. This facility would provide the equivalent of a low-temperature fast neutron position in the HFIR for development and preliminary qualification of vanadium alloys for fusion devices.

17206 (DOE/ER–0313/16, pp. 47-50) **Transmutation in copper-base brazing materials.** Garner, F.A. (Pacific Northwest Lab., Richland, WA (United States)); Greenwood, L.R.; Edwards, D.J. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Brazing compounds containing silver or gold will transmute during irradiation, forming significant amounts of either cadmium or mercury, respectively, in all neutron spectra of current interest to the fusion materials program. The impact of this transmutation on braze performance and on development of fission-fusion correlations has yet to be determined, but will be addressed in an irradiation experiment that was recently completed in FFTF-MOTA. A lesser amount of transmutation will occur in brazes containing tin, but no specimens containing brazes with tin have yet been irradiated.

17207 (DOE/ER–0313/16, pp. 53-56) **ITER material properties handbook.** Davis, J.W. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

In December the ITER Joint Central Team authorized the creation of a Materials Properties Handbook. This Handbook is a cooperative activity between the four parties of ITER (Japan, the E.U., the R.F., and the US). The US Home Team has been selected to coordinate the documentation, while all four Parties will provide data. During this period the effort focused on organizing this activity, developing a format for use by all of the parties, and demonstrating the ability to electronically transfer files between the four parties. First draft of the Handbook is scheduled for July.

17208 (DOE/ER–0313/16, pp. 61-79) **Void swelling in binary Fe-Cr alloys at 200 dpa.** Gelles, D.S. (Pacific Northwest Lab., Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Microstructural examinations have been performed on a series of binary Fe-Cr alloys irradiated in the FFTF/MOTA at 425°C to 200 dpa. The data represent the highest swelling levels reported in neutron irradiated ferritic alloys. The alloy compositions ranged from 3% to 18% Cr in 3% Cr increments, and the irradiation temperature corresponded to the peak swelling condition for this alloy

class. Density measurements showed swelling levels as high as 7.4%, with the highest swelling found in the Fe-9Cr and Fe-6Cr alloys. Microstructural examinations revealed that the highest swelling conditions contained well-developed voids, often as large as 100 nm, and a dislocation network comprised of both a/2<111> and a<100> Burgers vectors. Swelling was lower in the other alloys, and the swelling reduction could be correlated with increased precipitation. These results are considered in light of the current theories for low swelling in ferritic alloys, but no theory is available to completely explain the results.

17209 (DOE/ER–0313/16, pp. 80-107) **Data base on permeation, diffusion, and concentration of hydrogen isotopes in fusion reactor materials.** Brimhall, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Simonen, E.P.; Jones, R.H. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

In evaluating fusion reactor performance, knowledge about permeation, diffusion and concentration of hydrogen isotopes throughout the structure is of critical importance. The data base on hydrogen isotope permeation in relevant fusion reactor materials is reviewed in this report. Comparisons are made within alloys of the same type as well as with all the other classes of alloys. Both gas-driven permeation (GDP) and plasma-driven permeation (PDP) are included. Data on GDP behavior in Fe and Ni alloys are relatively consistent. In metals that have a high solubility and/or are hydride formers, e.g., V, Nb, Ti, there is much more variation in the data, and surface effects play a very dominant role. Permeation under plasma conditions is less well understood as more variables enter the relationship, e.g., reemission phenomena, internal concentration gradients, radiation effects, etc. The data show that materials do not necessarily rank in the same order under PDP conditions as under GDP conditions. A summary of the factors that influence permeation and the relative magnitude of their effect is given in the report.

17210 (DOE/ER–0313/16, pp. 111-127) **Development of low-chromium, chromium-tungsten steels for fusion.** Klueh, R.L. (Oak Ridge National Lab., TN (United States)); Alexander, D.J. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

High-chromium (9-12% Cr) Cr-Mo and Cr-W ferritic steels are favored as candidates for fusion applications. In the early work to develop reduced-activation steels, an Fe-2.25Cr-2W-0.25V-0.1C steel (designated 2 1/4Cr-2WV) had better strength than an Fe-9Cr-2W-0.25V-0.07Ta-0.1C (9Cr-2WVTa) steel (compositions are in weight percent). However, the 2 1/4Cr-2WV had less-than-adequate impact toughness, as determined by the ductile-brittle transition temperature and upper-shelf energy of a Charpy impact test. Because low-chromium steels have some advantages over high-chromium steels, a program to develop low-chromium steels is in progress. Microstructural analysis indicated that the reason for the inferior impact toughness of the 2 1/4Cr-2WV was the granular-bainite microstructure obtained when the steel was normalized. Properties can be improved by developing an acicular bainite structure by increasing the cooling rate after austenitization. Alternatively, acicular bainite can be promoted by increasing the hardenability. Hardenability was changed by adding small amounts of boron and chromium to the 2 1/4Cr-2WV composition. A combination of B, Cr, and Ta additions resulted in low-chromium reduced-activation steels with mechanical properties comparable to those of 9Cr-2WVTa.

17211 (DOE/ER–0313/16, pp. 128-141) **Microstructure-mechanical properties correlation of irradiated conventional and reduced-activation martensitic steels.** Klueh, R.L. (Oak Ridge National Lab., TN (United States)); Alexander, D.J.; Kai, Ji-Jung. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Tensile, Charpy, and transmission electron microscopy specimens of two conventional steels, modified 9Cr-1Mo (9Cr-1MoVNb) and Sandvik HT9 (12Cr-1MoVW), and two reduced-activation steels, Fe-9Cr-2W-0.25V-0.1C (9Cr-2WV) and Fe-9Cr-2W-0.25V-0.07Ta-0.1C (9Cr-2WVTa), were irradiated in the Fast Flux Test Facility. Before irradiation, $M_{23}C_6$ was the primary precipitate in all four steels, which also contained some MC. Neutron irradiation did not substantially alter the $M_{23}C_6$ and MC. No new phases formed during irradiation of the 9Cr-2WV and 9Cr-2WVTa, but chi-phase precipitated in the 9Cr-1MoVNb and chi-phase and α' precipitated in the 12Cr-1MoVW. Irradiation-produced dislocation loops were observed in 9Cr-2WV, 9Cr-2WVTa, and 12Cr-1MoVW. The irradiation-produced microstructural changes caused the steels to harden, as measured by the change in yield stress. Hardening was correlated with a change in the Charpy impact properties of 9Cr-1MoVNb, 12Cr-1MoVW, and 9Cr-2WV. Although irradiation caused a yield stress increase of the 9Cr-2WVTa similar to that for 9Cr-2WV and 9Cr-1MoVNb, the change in Charpy properties was considerably less for 9Cr-2WVTa. This difference in Charpy behavior of the 9Cr-2WVTa with that of the 9Cr-2WV and 9Cr-1MoVNb was attributed to differences in the fracture stress-temperature relationship and/or the flow stress-temperature relationship between the 9Cr-2WVTa and the other two 9Cr steels.

17212 (DOE/ER–0313/16, pp. 146-160) **Microstructural examination of commercial ferritic alloys at 200 dpa.** Gelles, D.S. (Pacific Northwest Lab., Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Microstructures and density change measurements are reported for Martensitic commercial steels HT-9 and Modified 9Cr-1Mo (T9) and oxide dispersion strengthened ferritic alloys MA956 and MA957 following irradiation in the FFTF/MOTA at 420°C to 200 DPA. Swelling as determined by density change remains below 2% for all conditions. Microstructures are found to be stable except in recrystallized grains of MA957, which are fabrication artifacts, with only minor swelling in the Martensitic steels and α' precipitation in alloys with 12% or more chromium. These results further demonstrate the high swelling resistance and microstructural stability of the ferritic alloy class.

17213 (DOE/ER–0313/16, pp. 173-193) **Fracture toughness of irradiated candidate materials for ITER first wall/blanket structures.** Alexander, D.J. (Oak Ridge National Lab., TN (United States)); Pawel, J.E.; Grossbeck, M.L.; Rowcliffe, A.F.; Shiba, K. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Candidate materials for first wall/blanket structures in ITER have been irradiated to damage levels of about 3 dpa at nominal irradiation temperatures of either 90 or 250°C. These specimens have been tested over a temperature range from 20 to 250°C. The results show that irradiation at these temperatures reduces the fracture toughness of austenitic stainless steels, but the toughness remains quite high. The toughness decreases as the test temperature increases. Irradiation at 250°C is more damaging than at 90°C, causing larger decreases in the fracture toughness. Ferritic steels are embrittled by the irradiation, and show their lowest toughness at room temperature.

17214 (DOE/ER–0313/16, pp. 194-201) **Low temperature radiation-induced segregation relative to IASCC and ITER.** Simonen, E.P. (Pacific Northwest Lab., Richland, WA (United States)); Jones, R.H.; Charlot, L.A.; Bruemmer, S.M. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation induced segregation at grain boundaries in stainless steel has been evaluated as a function of temperature. Segregation caused by ion irradiation was measured and compared to temperature-dependent model predictions. The model was subsequently used to extrapolate predictions to ITER operating

conditions. For ion irradiation, segregation was found to extend to temperatures below 400°C which implies that segregation is expected at temperatures less than 200°C for ITER irradiation damage rates. The model predictions were in accord with Cr depletion levels and profile widths as measured using FEG-STEM examination of ion irradiated grain boundaries. The model was further shown to be consistent with measured depletion levels at grain boundaries in 316 stainless steel irradiated in a light-water reactor at 288°C. The findings of this study suggest that chromium depletion and hence IASCC may be a concern for stainless steel structures irradiated in ITER high-temperature water environments.

17215 (DOE/ER–0313/16, pp. 204-211) **Swelling and structure of vanadium alloys irradiated in the dynamic helium charging experiment.** Chung, H.M. (Argonne National Lab., IL (United States)); Loomis, B.A.; Tsai, H.; Nowicki, L.; Gazda, J.; Smith, D.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Combined effects of dynamically charged He and neutron damage on density change, void distribution, and microstructural evolution of V-4Cr-4Ti have been determined after irradiation to 18-31 dpa at 425-600°C in the Dynamic Helium Charging Experiment (DHCE). For specimens irradiated to ≈18 dpa at 600°C with an estimated He/dpa ratio of 3-9 appm He/dpa (a range similar to the fusion-relevant ratio of ≈5 appm He/dpa), only a few microvoids were observed at the interface of the grain matrix and some Ti(O,N,C) precipitates. No microvoids were observed either in the grain matrix or near grain boundaries. It seems that most of the dynamically produced He atoms are trapped in the grain matrix without significant void nucleation or growth. In this group of DHCE specimens, density changes were similar to those of non-DHCE (negligible He generation) specimens for a comparable fluence and irradiation temperature. Significant numbers of microvoids in the grain matrix and on localized grain boundaries were present only in specimens irradiated to ≈31 dpa at 425°C in high-tritium capsules, in which an excessive amount of helium was generated (estimated He/dpa ratio of 10-35 appm). Discontinuous regions of void segregation on grain boundaries were observed, and void number-density was significantly lower than in other alloys irradiated in tritium-trick experiments. Density changes of the specimens were significantly higher than those from non-DHCE irradiations. Microstructural evolution in V-4Cr-4Ti was similar for DHCE and non-DHCE irradiations, except for void number-density and distribution. As in non-DHCE specimens, irradiation-induced precipitation of ultrafine Ti_5Si_3 was observed for irradiation at 600°C but not at 425°C.

17216 (DOE/ER–0313/16, pp. 212-219) **Effect of dynamically charged helium on mechanical properties of V-4Cr-4Ti.** Chung, H.M. (Argonne National Lab., IL (United States)); Loomis, B.A.; Tsai, H.; Nowicki, L.; Busch, D.E.; Smith, D.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

V-4Cr-4Ti has been reported to be virtually immune to irradiation embrittlement under conditions of negligible helium generation; DBTTs determined from one-third-size Charpy-impact specimens irradiated in a non-DHCE experiment were <−200°C. The effects of dynamically charged helium and tritium, and of neutron damage, on DBTT of the alloy were determined after irradiation in the Dynamic Helium Charging Experiment (DHCE). TEM disks irradiated to 18-31 dpa at 425-600°C were fractured by repeated bending in a low-temperature bath. Miniature specimens were used because no Charpy-impact specimens were included in the DHCE experiment. Ductile-brittle transition behavior was determined from quantitative SEM fractography. Brittle fracture surface morphology was not observed at >−120°C regardless of the level of dpa damage or helium and tritium content in the alloy. Predominantly brittle-cleavage fracture morphologies were observed only at −196°C in some specimens irradiated to 31 dpa at 425°C and in which the estimated helium and tritium contents were highest. This indicates a DBTT between −175 and −200°C in specimens containing the highest levels of dpa damage, helium, and tritium in the DHCE experiment. No intergranular fracture was observed.

17217 (DOE/ER–0313/16, pp. 220-224) **Status of the dynamic helium charging experiment.** Tsai, H. (Argonne National Lab., IL (United States)); Strain, R.V.; Chung, H.M.; Smith, D.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Seven DHCE capsules containing vanadium-alloy specimens were irradiated in the MOTA-2B vehicle in FFTF to ≈20-29 dpa. In this and the previous reporting periods, equipment and procedures were developed at Argonne National Laboratory-East to disassemble these capsules. Six of the seven capsules have been disassembled. (The seventh capsule was processed in April 1994, immediately following this reporting period). Effluence of tritium into the cell exhaust was <2% of the total inventory. No contamination incidents occurred during the DHCE disassembly work. Initial testing of the retrieved specimens is under way.

17218 (DOE/ER–0313/16, pp. 240-243) **Chemical and mechanical interactions of interstitials in V-5%Cr-5%Ti.** DeVan, J.H. (Oak Ridge National Lab., TN (United States)); DiStefano, J.R.; Hendricks, J.W. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Gas-metal reaction studies of V-5Cr-5Ti were conducted to determine the kinetics of reactions with H_2 and O_2, respectively, at 400-500°C. Reaction rates were determined through weight change measurements and chemical analysis, and effects on mechanical properties were evaluated by room temperature tensile tests. Exposure to hydrogen at pressures between 10^{-4} to 10^{-2} torr lowered the tensile ductility in the case of coarse-grained specimens but had little effect on finer-grained specimens. Similarly oxygen uptake at 500°C, at concentrations as low as 200 ppm (by weight), significantly lowered the ductility of the coarser-grained but not the finer-grained material.

17219 (DOE/ER–0313/16, pp. 293-304) **Influence of transmutation on microstructure, density, change, and embrittlement of vanadium and vanadium alloys irradiated in HFIR.** Ohnuki, S. (Hokkaido Univ., Sapporo (Japan)); Takahashi, H.; Shiba, K.; Hishinuma, A.; Pawel, J.; Garner, F.A. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830 ; AC05-84OR21400. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Addition of 1 at.% nickel to vanadium and V-10Ti, followed by irradiation along with the nickel-free metals in HFIR to 2.3 x 10^{22}n cm^{-2}, E>0.1MeV (corresponding to 17.7 dpa) at 400°C, has been used to study the influence of helium on microstructural evolution and embrittlement. Approximately 15.3% of the vanadium transmuted to chromium in these alloys. The ~50 appm helium generated from the $^{58}Ni(n,\gamma)^{59}Ni(n,\alpha)^{56}Fe$ sequence was found to exert much less influence than either the nickel directly or the chromium formed by transmutation. The V-10Ti and V-10Ti-1Ni alloys developed an extreme fragility and broke into smaller pieces in response to minor physical insults during density measurements. A similar behavior was not observed in pure V or V-1Ni. Helium's role in determination of mechanical properties and embrittlement of vanadium alloys in HFIR is overshadowed by the influence of alloying elements such as titanium and chromium. Both elements have been shown to increase the DBTT rather rapidly in the region of 10% (Cr + Ti). Since Cr is produced by transmutation of V, this is a possible mechanism for the embrittlement. Large effects on the DBTT may have also resulted from uncontrolled accumulation of interstitial elements such as C, N, and O during irradiation.

17220 (DOE/ER–0313/16, pp. 305-308) **Influence of flux-spectra differences on transmutation and swelling of vanadium alloys.** Garner, F.A. (Pacific Northwest Lab., Richland, WA (United States)); Greenwood, L.R. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In

Fusion materials semiannual progress report for the period ending March 31, 1994. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The swelling of vanadium and its alloys is known to be sensitive to the level of chromium in the alloy. Chromium is also the major transmutation product during neutron irradiation, however, and the production rate of chromium is very sensitive to neutron spectra. It appears that an apparent dependence of void swelling in pure vanadium irradiated in FFTF may arise in part from the spectral difference that accompanies changes in displacement rate.

17221 (DOE/ER–0313/16, pp. 309-312) **Dependence of vanadium alloy density on starting composition, transmutation and segregation.** Garner, F.A. (Pacific Northwest Lab., Richland, WA (United States)); Loomis, B.A. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The density of vanadium alloys is strongly dependent on solute identity and concentration, especially for additions of chromium and titanium. One consequence of this dependence is that radiation-induced density changes arise from segregation and precipitation. Transmutation of vanadium to chromium can also lead to significant increases in density and can therefore complicate somewhat the interpretation of swelling data derived using immersion density techniques.

17222 (DOE/ER–0313/16, pp. 314-341) **Copper alloys for high heat flux structure applications.** Zinkle, S.J. (Oak Ridge National Lab., TN (United States)); Fabritsiev, S.A. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The mechanical and physical properties of copper alloys are reviewed and compared with the requirements for high heat flux structural applications in fusion reactors. High heat flux structural materials must possess a combination of high thermal conductivity and high mechanical strength. The three most promising copper alloys at the present time are oxide dispersion-strengthened copper (Cu-Al_2O_3) and two precipitation-hardened copper alloys (Cu-Cr-Zr and Cu-Ni-Be). These three alloys are capable of room temperature yield strengths >400 MPa and thermal conductivities up to 350 W/m-K. All of these alloys require extensive cold working to achieve their optimum strength. Precipitation-hardened copper alloys such Cu-Cr-Zr are susceptible to softening due to precipitate overaging and recrystallization during brazing, whereas the dislocation structure in Cu-Al_2O_3 remains stabilized during typical high temperature brazing cycles. All three alloys exhibit good resistance to irradiation-induced softening and void swelling at temperatures below 300°C. The precipitation-strengthened alloys typically soften during neutron irradiation at temperatures above about 300°C and therefore should only be considered for applications operating at temperatures <300°C. Dispersion-strengthened copper may be used up to temperatures in excess of 500°C. Based on the available data, dispersion-strengthened copper (Cu-Al_2O_3) is considered to be the best candidate for high heat flux structural applications.

17223 (DOE/ER–0313/16, pp. 351-355) **Preparation of Russian copper alloy creep specimens.** Eiholzer, C.R. (Westinghouse Hanford Co., Richland, WA (United States)); Hamilton, M.L.; Barabash, V. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Eleven creep specimens of the Russian copper alloy MAGT-0.2 were pressurized and welded closed. The specimens were pressurized to levels ranging from 7.2 to 15.6 MPa (1052 to 2267 psia). These pressures will produce hoop stresses between 55 and 185 MPa (7,977 to 26,830 psia) when irradiated at 120°C.

17224 (DOE/ER–0313/16, pp. 356-363) **Void swelling of pure copper, Cu-5Ni and Cu-5Mn alloys irradiated with fast neutrons.** Watanabe, H.; Garner, F.A. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The effects of cold-work level and solute addition (nickel or manganese) on pure copper under fast neutron irradiation have been investigated. Neutron irradiation was conducted in the Fast Flux Test Facility (FFTF) at temperatures from 638 to 873K to doses ranging from 8 to 98 dpa. In pure copper, the void swelling behavior was investigated as a function of cold-work level. At 638 and 703K, 10% cold-work reduced swelling somewhat with little influence at higher cold-work levels. In comparison with pure copper, void swelling was suppressed by 5% nickel addition at 648K but slightly increased at 696K. Cu-5Mn resisted swelling in both annealed and 40% cold-worked specimens in all temperatures examined. At 648K, void formation was not detected. Only stacking fault tetrahedra were observed in this specimen.

17225 (DOE/ER–0313/16, pp. 364-367) **Influence of nickel and beryllium content on swelling of copper irradiated in COBRA-1A.** Garner, F.A. (Pacific Northwest Lab., Richland, WA (United States)); Singh, B.N. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

A series of annealed Cu-Ni dilute binary alloys were irradiated in COBRA-1A in EBR-II at temperatures of 373, 420 and 500°C. Density measurements have been performed for specimens irradiated at 373°C to 1.78 x 10^{22}n cm^{-2} (~11.3 dpa for pure copper). At this temperature and dose level nickel additions suppress swelling. There is a possible indication that some type of segregation-related phenomenon also occurs, yielding radiation-induced densification.

17226 (DOE/ER–0313/16, pp. 371-375) **Fabrication of aluminum nitride and its stability in liquid alkali metals.** Natesan, K. (Argonne National Lab., IL (United States)); Rink, D.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

AlN has been selected as a prime candidate for electrically insulating the V-alloy first wall in the self-cooled ITER concept. Several methods are being evaluated for fabricating coatings that have adequate thickness and desirable physical, electrical, chemical, and mechanical properties. Coatings developed thus far are being exposed to liquid Li at 350 and 400°C.

17227 (DOE/ER–0313/16, pp. 376-381) **Development of electrical insulator coatings: In-situ electrical resistance measurements on CaO-coated V-5%Cr-5%Ti in liquid lithium.** Park, J.H. (Argonne National Lab., IL (United States)); Dragel, G.; Clark, R.W. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract W-31109-ENG-38. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The electrical resistance of CaO coatings produced on V-5%Cr-5%Ti by exposure of the alloy to liquid Li that contained 4 at.% dissolved Ca was measured as a function of time at temperatures of 250 to 698°C. The solute element, Ca in liquid Li, reacted with the alloy substrate at 420°C to produce a CaO coating. The resistance of the coating layer was ≈ 0.4 and 35.7 Ω at 267 and 698°C, respectively. Thermal cycling between 267 and 698°C changed the resistance of the coating layer, which followed insulator behavior. These results and those reported previously suggest that thin homogeneous coatings can be produced on variously shaped surfaces by controlling the exposure time, temperature, and composition of the liquid metal. This coating method is applicable to reactor components of various shapes (e.g., inside/outside of tubes, complex geometrical shapes) because the coating is formed by liquid-phase reaction. The liquid metal can be used over and over because only the solutes are consumed within the liquid metal.

17228 (DOE/ER–0313/16, pp. 385-391) **Performance of ceramic breeder materials in the SIBELIUS experiment.** Kopasz, J.P. (Argonne National Lab., IL (United States)); Johnson, C.E.; Baldwin, D.L. Oak Ridge National Lab., TN (United States). Sep

1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Lithium containing ceramics are among the leading candidates for use as tritium breeding materials in a fusion reactor. An issue affecting both the safety and economics of the reactor is the tritium inventory. The SIBELIUS experiment was designed to examine material compatibility between different components of a breeder blanket and to examine the tritium inventory in the components of the blanket. The tritium inventory in each of the ceramics was determined by measurements at end of life and were found to be quite low and in agreement with those determined in tests with no beryllium present. The inventory increased in the order lithium zirconate < lithium oxide < lithium orthosilicate < lithium aluminate with the inventory in the zirconate less than 0.03 wppm at 550°C.

17229 (DOE/ER–0313/16, pp. 392-405) **Ab initio calculations for hydrogen adsorption on lithium oxide surfaces.** Sutjianto, A. (Argonne National Lab., IL (United States)); Tam, S.W.; Curtiss, L.; Johnson, C.E.; Pandey, R. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The study of hydrogen chemisorption on the (110) and (111) lithium oxide surfaces have been investigated by means of ab initio Hartree-Fock calculations. In general, for the n-layer slab (where n = 2 and 3) of the neutral (110) and for the three-layer slab of the neutral (111) surfaces, there is no hydrogen chemisorption. The oxygen 2p band of the (110) surface is stabilized by the presence of more stacking sequences of layers which prevents charge transfer to the hydrogen. In the case of a neutral (110) layer due to low coordination of the anion, there is hydrogen chemisorption in the form of OH^- and $Li^+H^-Li^+$ with the chemisorption energy of 0.93 eV. For the neutral (111) surface, there is no hydrogen chemisorption since the oxygen layer is screened by the cation layers hindering the charge transfer to the hydrogen.

17230 (DOE/ER–0313/16, pp. 406-415) **Irradiation of lithium zirconate pebble-bed in BEATRIX-II, Phase II.** Verrall, R.A. (Chalk River Labs., Chalk River, Ontario (Canada)); Sullivan, J.D.; Slagle, O.D.; Hollenberg, G.W.; Kurasawa, T. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

BEATRIX-II was an in situ tritium recovery experiment that was designed to characterize the behavior of lithium ceramics irradiated to a high burnup, and to assess their suitability for use in a fusion reactor blanket. This paper describes the results from a vented canister containing lithium enriched lithium zirconate spheres (85% ^6Li) that were irradiated to a burnup of 5.2% (total lithium) in a steep temperature profile - 400°C edge, 1100°C center. The reference sweep gas was He-0.1%H_2, with systematic tests using alternate compositions: He-0.01%H_2 and pure He (maximum duration 8 days). Tritium recovery decreased slightly at lower H_2 concentrations. For example, the buildup of inventory during a 4-day test in pure He was 0.8 Ci which was approximately 6.5% of the tritium generated in the lithium zirconate during that period. The steadiness of the bed central temperature and the high tritium release rate, together with low moisture release rate, indicate good performance of the zirconate bed.

17231 (DOE/ER–0313/16, pp. 428-437) **Tensile behavior of irradiated SiC fibers.** Osborne, M.C. (Rensselaer Polytechnic Institute, Troy, NY (United States)); Steiner, D.; Snead, L.L. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC05-84OR21400 ; FG02-92ER54181. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Tensile results are presented for low oxygen Nicalon fibers neutron irradiated at damage levels of 0.013 displacements per atom (dpa), 0.13 dpa and 0.32 dpa. Single fibers were tensile tested and analyzed, using Weibull statistics, for mean strength and distribution. Tensile modulus was also determined. Using a diffractometer, the fiber grain size and percent crystallinity were determined. The mean strength and modulus decreased by 20% but then increased with the highest damage level tested. Both grain size and crystallinity decreased as dose increased. These initial results of low level neutron irradiation of low oxygen Nicalon fibers exhibit no substantial degradation of the properties investigated. Therefore, continued research at higher doses is recommended.

17232 (DOE/ER–0313/16, pp. 438-444) **Temperature dependence of the subcritical crack growth rate of a SiC/SiC composite.** Jones, R.H. (Pacific Northwest Labs., Richland, WA (United States)); Henager, C.H. Jr. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract AC06-76RL01830. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

The long term stability of SiC/SiC composites is an issue regarding their use for fusion structural applications only because there is insufficient data to determine if there is really a problem. Crack growth measurements have been made over the temperature range of 800 to 1100°C, in high-purity Ar, to help assess the long term stability of these materials. Stage II crack growth rates ranging from 2×10^{-9} m/s at 1100°C down to 3×10^{-11} m/s at 800°C were found for a 2-D SiC/SiC composite reinforced with 40% Nicalon fibers. The Stage II velocities obeyed an Arrhenius relationship over this temperature range with an activation energy of 235 kJ/mol. At a fusion relevant temperature of 800°C, the crack velocity will result in a crack growth of 1 mm/yr. More creep resistant fibers are expected to reduce this crack growth amount to less than 1×10^{-2} mm/yr. at 800°C. This is not an excessive amount of crack extension for a material with a fracture toughness of about 20 MPa $m^{1/2}$.

17233 (DOE/ER–0313/16, pp. 445-458) **Defect energetics calculations of SiC using three representative empirical potentials.** Huang, Hanchen (Univ. of California, Los Angeles, CA (United States)); Wong, J.; Ghoniem, N.; Baskes, M. Oak Ridge National Lab., TN (United States). Sep 1994. DOE Contract FG03-91ER54115 ; AC04-94AL85000. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Defect energetics is a critical issue not only for irradiation damage but also for semiconductor applications. Calculations of defect energetics rely mainly on using empirical potentials, which are developed based on information from equilibrium crystal configurations and which may not be suitable for investigating defected configurations. Therefore, not all potentials give accurate enough results. This paper first calibrates MEAM for silicon carbide. Calculations are then made for defect energetics of silicon carbide using the MEAM and two other representative empirical potentials. Results obtained with these potentials are compared with available first principal calculations and experimental data. The results not only provide more information for defect formation and migration in silicon carbide, but also provide a critical assessment of the three empirical potentials. The results are analyzed in terms of construction and calibration of the empirical potentials.

17234 (DOE/ER–0313/16, pp. 459-484) **Phenomenological inelastic constitutive equations for SiC and SiC fibers under irradiation.** El-Azab, A. (Univ. of California, Los Angeles, CA (United States)); Ghoniem, N.M. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994.* 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

Experimental data on irradiation-induced dimensional changes and creep in β-SiC and SiC fibers is analyzed, with the objective of studying the constitutive behavior of these materials under high-temperature irradiation. The data analysis includes empirical representation of irradiation-induced dimensional changes in SiC matrix and SiC fibers as function of time and irradiation temperature. The analysis also includes formulation of simple scaling laws to extrapolate the existing data to fusion conditions on the basis of the physical mechanisms of radiation effects on crystalline solids. Inelastic constitutive equations are then developed for SCS-6 SiC fibers, Nicalon fibers and CVD SiC. The effects of applied stress, temperature, and irradiation fields on the deformation behavior of this class of materials are simultaneously represented. Numerical

results are presented for the relevant creep functions under the conditions of the fusion reactor (ARIES IV) first wall. The developed equations can be used in estimating the macro mechanical properties of SiC-SiC composite systems as well as in performing time-dependent micro mechanical analysis that is relevant to slow crack growth and fiber pull-out under fusion conditions.

17235 (DOE/ER–0313/16, pp. 485-492) **Tritium transport and retention in silicon carbide.** Tam, S.W. (Argonne National Lab., IL (United States)); Kopasz, J.; Johnson, C.E. Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994*. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

A theoretical framework describing trapping, diffusion and desorption of tritium from vapor-deposited β-silicon carbide has been proposed and an analytical version of this model was derived. This analytical model was used to extract trapping, diffusion, and desorption parameters from a limited part of the experimental data set. The resulting parameter-free model was then used to test its predictive capability by calculating the time-dependent release behavior for the high temperature regimes. General agreement with the release data was found supporting the suitability of the present approach. Tritium trapping was found to be strong. Both bulk diffusion and surface desorption make comparable contributions to tritium release from the silicon carbide. Improvements beyond the present analytical model to include dynamical detrapping can be achieved with the proposed framework.

17236 (DOE/ER–0313/16, pp. 517-522) **A comparison of the effect of radiation on the thermal conductivity of sapphire at low and high temperature.** White, D.P. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). Sep 1994. In *Fusion materials semiannual progress report for the period ending March 31, 1994*. 534p. Order Number DE95003404. Source: OSTI; NTIS; INIS; GPO Dep.

It has been proposed that sapphire be used in insulating feedthroughs and windows in radiofrequency and microwave heating systems in fusion reactors. The degradation of the thermal conductivity of sapphire with irradiation is a concern in the design of these windows. It has been proposed to cool microwave windows to liquid nitrogen temperatures to take advantage of the thermal conductivity peak, which occurs at approximately 30K in unirradiated sapphire, and the lower dielectric loss tangent at these temperatures. In this paper the methods used to calculate the thermal conductivity and the changes which occur with changes in point defect concentration will be reviewed and the results of the low temperature calculations will be compared to the high temperature calculations. It is found that vacancy scattering can significantly reduce the thermal conductivity over a wide temperature range; for example, a vacancy concentration of 0.01 per atom leads to a fractional change of about 90% at 77K versus 43% at 400K. This reduction has significance for the design and placement of radio frequency and microwave windows in fusion reactors.

17237 (DOE/ER/52143–T3) **Damage analysis and fundamental studies for fusion reactor materials development for the period March 1, 1991–February 28, 1994. Final report.** Odette, G.R.; Lucas, G.E. California Univ., Santa Barbara, CA (United States). Dept. of Chemical and Nuclear Engineering. Jan 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-87ER52143. Order Number DE95008728. Source: OSTI; NTIS; INIS; GPO Dep.

The philosophy of the program at the University of California Santa Barbara has been to develop a fundamental understanding of both the basic damage processes and microstructural evolution that take place in a material during neutron irradiation and the consequent dimensional and mechanical property changes. This fundamental understanding can be used in conjunction with empirical data obtained from a variety of irradiation facilities to develop physically-based models of neutron irradiation effects in structural materials. The models in turn can be used to guide alloy development and to help extrapolate the irradiation data base to the fusion reactor regime. This philosophy is consistent with that of the national and international programs for developing structural materials for fusion reactors. During this period work has encompassed: (1) analysis of the degradation of the mechanical properties of austenitic stainless steels for the purpose of assessing the feasibility of using these steels in ITER; (2) examining helium effects on radiation damage in austenitic and ferritic stainless steels; (3) development and application of electropotential drop techniques to monitor the growth of cracks in steel specimens for a variety of specimen geometries (4) development of advanced methods of measuring fracture properties; (5) combining micromechanical modeling of fracture with finite element calculations of crack and notch-tip stress and strain fields to predict failure; (6) developing a data base on flow and fracture properties of ferritic steels. Each of these activities is described in more detail below and in greater detail in the attached publications.

17238 (ENEA-RT-ERG-FUS–93-35) **FTU collective scattering diagnostics: Scattering geometries, expected performances, antenna decoupling and detection requirements.** Orsitto, F.P. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Tartari, U. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Oct 1993. 37p. (RT/ERG-FUS–93-35). Order Number DE95771054. Source: OSTI; NTIS (US Sales Only).

The Collective Thomson Scattering (CTS) has been pointed out as a tool useful to measure the velocity distribution function of plasma ions: the present contains a proposal for an experimental program on the CTS for FTU (Frascati Tokamak Upgrade) where a 140 GHz ($lamda_0$=0.214 cm) gyrotron is used as main radiation source. The following arguments are examined: the concrete problems of the geometries interesting and feasible on FTU, i.e. the backscattering and the 30^0 scattering in the 'symmetric' configuration of the collecting and receiving antennas; the signal to noise ratio obtainable in that geometries, which results greater than 300; the figures of the antenna decoupling, which must be of the order of 80 dB, and the equivalent detection system temperature which must be around 10 eV.

17239 (ENEA-RT-ERG-FUS–94-01) **Electron-beam welding of grill flanges of FTU additional heating system.** Cucchiaro, A. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Marra, A. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Oct 1994. 12p. (CONF-9405291–2: 2. European conference on joining technology (Eurojoin-2), Florence (Italy), 16-18 May 1994; RT/ERG-FUS–94-01). Order Number DE95771036. Source: OSTI; NTIS (US Sales Only).

The research and development program of the fusion sector of ENEA (Italian Agency for New Technologies, Energy and Environment) Frascati center is mainly based on experiments on the Frascati Tokamak Upgrade (FTU) machine. The FTU is a medium-high magnetic field (8 T) tokamak with a radio-frequency (RF) additional heating system (8 MW, 8 GHz) that can heat the plasma to temperatures of fusionistic interest. The RF power is coupled to the plasma by a coupling structure consisting of three grills, each formed of an array of waveguides welded at the terminal flanges by an electron-beam technique. This solution allows highly accurate dimensions and optimum clean-surface conditions of the welded copper joints.

17240 (ENEA-RT-ERG-FUS–94-10) **Effect of argon injection on high Z impurity generation from poloidal inconel limiter in FTU.** Pieroni, L. (ENEA, Frascati (Italy). Centro Ricerche Energia); Franzoni, G.; Condrea, I. Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy). Nov 1994. 20p. (RT/ERG-FUS–94-10). Order Number DE95771008. Source: OSTI; NTIS (US Sales Only).

Argon injection experiment on FTU (Frascati Tokamak Upgrade) plasma has been utilised to clarify the physical mechanism responsible for impurity production. A simple O-D model for the SOL (scrape off layer), coupled with sputtering by the main deuteron flux and self-sputtering can reproduce the variation of impurity concentration, Ni in the case of inconel limiter in FTU, when Argon is puffed into the plasma. The increase of radiation power losses leads to a decrease of the SOL temperature, and therefore to a decrease of the sputtering yield. Since Z_{eff} remains essentially unchanged by Ar puffing, a fraction of high Z impurity is substituted by Ar ions. As a consequence both the line radiation emission profile and the total radiation losses are modified, while all the other plasma parameters (temperature and density profiles, ohmic power and energy confinement time) remain unchanged. Radiation losses

increase up to 80% of the imput power, at relatively high densities, with a corresponding decrease of the heat load on the limiter surface.

17241 (GA-A–21757) **Optimized profiles for improved confinement and stability in the DIII-D tokamak.** Taylor, T.S. (General Atomics, San Diego, CA (United States)); St. John, H.; Turnbull, A.D. General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States). Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; AC05-84OR21400. (CONF-9406270–8: 21. EPS conference on controlled fusion and plasma physics, Montpellier (France), 27 Jun - 1 jul 1994). Order Number DE95009606. Source: OSTI; NTIS; INIS; GPO Dep.

Simultaneous achievement of high energy confinement, τ_E, and high plasma beta, β, leads to an economically attractive compact tokamak fusion reactor. High confinement enhancement, $H = \tau_E/\tau_{E-ITER89P} = 4$, and high normalized beta $\beta_N = \beta/(I/aB) = 6\%\text{-m-T/MA}$, have been obtained in DIII-D experimental discharges. These improved confinement and/or improved stability limits are observed in several DIII-D high performance operational regimes: VH-mode, high ℓ_i H-mode, second stable core, and high beta poloidal. The authors have identified several important features of the improved performance in these discharges: details of the plasma shape, toroidal rotation or ExB flow profile, q profile and current density profile, and pressure profile. From the improved physics understanding of these enhanced performance regimes, they have developed operational scenarios which maintain the essential features of the improved confinement and which increase the stability limits using localized current profile control. The stability limit is increased by modifying the interior safety factor profile to be non-monotonic with high central q, while maintaining the edge current density consistent with the improved transport regimes and the high edge bootstrap current. They have calculated high beta equilibria with $\beta_N = 6.5$, stable to ideal n = 1 kinks and stable to ideal ballooning modes. The safety factor at the 95% flux surface is 6, the central q value is 3.9 and the minimum in q is 2.6. The current density profile is maintained by the natural profile of the bootstrap current, and a modest amount of electron cyclotron current drive.

17242 (GA-A–21814) **Recent results from the DIII-D tokamak and implications for future devices.** Luxon, J.L. (General Atomics, San Diego, CA (United States)). General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States); Lawrence Livermore National Lab., CA (United States); Sandia National Labs., Albuquerque, NM (United States). Feb 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; AC05-84OR21400 ; W-7405-ENG-48 ; AC04-76DP00789. (CONF-940843–18: 18. European symposium on fusion technology, Karlsruhe (Germany), 22-26 Aug 1994). Order Number DE95009605. Source: OSTI; NTIS; INIS; GPO Dep.

Improvements to the DIII-D tokamak have led to significant new research results and enhanced performance. These results provide important inputs to the design of next generation divertor systems including the upgrade of the DIII-D divertor. The use of graphite for the plasma facing components and careful wall preparation has enabled the routine achievement of regimes of enhanced energy confinement. In elongated discharges, triangularity has been found to be important in attaining good discharge performance as measured by the product of the normalized plasma pressure and the energy confinement time, $\beta\tau_E$ This constrains the design of the divertor configuration (X-point location). Active pumping of the divertor region using an in-situ toroidal cryogenic pump has demonstrated control of the plasma density in H-mode discharges and allowed the dependence of confinement on plasma density and current to be separately determined. Helium removal from the plasma edge sufficient to achieve effective ash removal in reactor discharges has also been demonstrated using this pumping configuration. The reduction of the heat flux to the divertor plates has been demonstrated using two different techniques to increase the radiation in the boundary regions of the plasma and thus reduce the heat flux to the divertor plates; deuterium gas injection has been used to create a strongly radiating localized zone near the X-point, and impurity (neon) injection to enhance the radiation from the plasma mantle. Precise shaping of the plasma current profile has been found to be important in achieving enhanced tokamak performance. Transiently shaped current profiles have been used to demonstrate regimes of plasmas with high beta and good confinement. Control of the current profile also is important to sustaining the plasma in the Very High (VH)-mode of energy confinement.

17243 (GA-A–21957) **DIII-D power supply, design, and development.** Nerem, A. General Atomics, San Diego, CA (United States). Feb 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-9504138–1: International power electronics conference, Yokohama (Japan), 3-7 Apr 1995). Order Number DE95009603. Source: OSTI; NTIS; INIS; GPO Dep.

An overview of the DIII-D power supply system with information details concerning the configuration, power ratings, acquisition costs, and cost scaling relevant to the design of ITER and other tokamaks is presented. The power supplies for the DIII-D tokamak were installed and commissioned during the late 1970's and the beginning of the 1980's. Several upgrades have been implemented during the last two years to solve increasing reliability problems encountered as the equipment aged, to provide enhanced operational flexibilities, and to enable operation at the higher power levels needed to provide experimental data relevant to the ITER and TPX design activities. These upgrades ranged from redesign of the power supply control systems to the replacement of vacuum circuit breakers which had become unreliable in service. A new interlock and protection system has also been implemented using the latest programmable logic controllers (PLC) and computer technology. These upgrades have been highly successful and are described to provide insight to many issues in the specification of high power converters. Power supply models used in the design of the DIII-D Plasma Control System are also described along with model verification test data. These models are being used in the development of a new advanced plasma control system for the DIII-D tokamak. Recent operational experience and results are presented.

17244 (INDC(NDS)–316) **FENDL neutronics benchmark: Specifications for the calculational neutronics and shielding benchmark.** Sawan, M.E. (Wisconsin Univ., Madison, WI (United States). Fusion Technology Inst.). International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Dec 1994. 12p. Order Number DE95629145. Source: OSTI; NTIS (US Sales Only); INIS.

During the IAEA Advisory Group Meeting on "Improved Evaluations and Integral Data Testing for FENDL" held in Garching near Munich, Germany in the period 12-16 September 1994, the Working Group II on "Experimental and Calculational Benchmarks on Fusion Neutronics for ITER" recommended that a calculational benchmark representative of the ITER design should be developed. This report describes the neutronics and shielding calculational benchmark available for scientists interested in performing analysis for this benchmark. (author).

17245 (INDC(NDS)–318) **FENDL activation benchmark: Specifications for the calculational activation benchmark.** Sawan, M.E. (Wisconsin Univ., Madison, WI (United States). Fusion Technology Inst.). International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Dec 1994. 19p. Order Number DE95629146. Source: OSTI; NTIS (US Sales Only); INIS.

During the IAEA Advisory Group Meeting on "Improved Evaluations and Integral Data Testing for FENDL" held in Garching near Munich, Germany in the period 12-16 September 1994, the Working Group IV recommended that a calculational activation benchmark representative of the ITER design should be developed. This report gives detailed description and specifications for the calculational benchmark as well as the neutron flux and adjoint gamma flux. (author).

17246 (INDC(NDS)–319) **Comparison of activation cross section measurements and experimental techniques for fusion reactor technology. Summary report of the IAEA specialists' meeting held in St. Petersburg, Russia, 7 to 9 September 1994.** Pashchenko, A.B. International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Feb 1995. 28p.

(CONF-9409333–: IAEA specialists' meeting on comparison of activation cross section measurement and experimental techniques for fusion reactor technology, St. Petersburg (Russian Federation), 7-9 Sep 1994). Order Number DE95629147. Source: OSTI; NTIS (US Sales Only); INIS.

The report contains the Summary of the IAEA Specialists' Meeting on "Comparison of Activation Cross Section Measurements and Experimental Techniques for Fusion Reactor Technology". The meeting was organized by the IAEA Nuclear Data Section (NDS) with co-operation and assistance of local organizers from the V.G. Khlopin Radium Institute, KRI, and held in St. Petersburg, Russia, from 7 to 9 September 1994. The aim of the meeting was to discuss and evaluate the preliminary results of the researches carried out in the framework of the international programme on Comparison of Activation Cross Section Measurements and Experimental Techniques for Fusion Reactor Technology coordinated by the IAEA Nuclear Data Section and to identify further measurements and actions of participating laboratories. The detailed conclusions and recommendations of the meeting are presented in Attachment 1 of the summary report. It was confirmed that for further comparison of experimental techniques the experimental groups at JAERI (Tokai, Japan), KRI (St. Petersburg, Russia), IPPE (Obninsk, Russia) and IEP (Debrecen, Hungary) will join in a collaborative program on comparing their measurement techniques and do measurements for reactions where discrepancies between their previous measurements exist. In cases where the JAERI results are the only existing data or deviate strongly from previous measurements, collaboration between KRI, IEP, IPPE and other institutions can consider measurements of these cross sections in order to clarify the situation. (author).

17247 (INEL–95/0002) **Fusion Safety Program annual report, fiscal year 1994.** Longhurst, G.R.; Cadwallader, L.C.; Dolan, T.J.; Herring, J.S.; McCarthy, K.A.; Merrill, B.J.; Motloch, C.G.; Petti, D.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008872. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the major activities of the Fusion Safety Program in fiscal year 1994. The Idaho National Engineering Laboratory (INEL) is the designated lead laboratory and Lockheed Idaho Technologies Company is the prime contractor for this program. The Fusion Safety Program was initiated in 1979. Activities are conducted at the INEL, at other DOE laboratories, and at other institutions, including the University of Wisconsin. The technical areas covered in this report include tritium safety, beryllium safety, chemical reactions and activation product release, safety aspects of fusion magnet systems, plasma disruptions, risk assessment failure rate data base development, and thermalhydraulics code development and their application to fusion safety issues. Much of this work has been done in support of the International Thermonuclear Experimental Reactor (ITER). Also included in the report are summaries of the safety and environmental studies performed by the Fusion Safety Program for the Tokamak Physics Experiment and the Tokamak Fusion Test Reactor and of the technical support for commercial fusion facility conceptual design studies. A major activity this year has been work to develop a DOE Technical Standard for the safety of fusion test facilities.

17248 (INIS-JP–028, pp. 71-73) **Irradiation effects on solid breeder materials of fusion reactor.** Nagae, Teruhito (Kyoto Univ. (Japan). Faculty of Engineering); Magari, Tadashi; Moriyama, Hirotake; Moritani, Kimikazu; Ito, Yasuhiko. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1993. 156p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Faculty of Engineering, Kyoto University.* Order Number DE95709897. Source: OSTI; NTIS; INIS.

Irradiation defects are important for the tritium recovery performance of fusion reactor solid breeder materials under irradiation. In the present study, the production behavior of irradiation defects in Li_4SiO_4 and Li_2SiO_3 was studied by an in-situ luminescence measurement technique. Also, tritium recovery experiments were performed with neutron-irradiated Li_4SiO_4 and Li_2SiO_3 samples. Irradiation defects were observed to affect the tritium behavior. (author).

17249 (INIS-JP–029, pp. 57-59) **In situ observations of trapped deuterium in iron pre-bombarded with ^{3}He ions.** Matsuoka, Kotaro (Kyoto Univ. (Japan). Faculty of Engineering); Takagi, Ikuji; Fujita, Haruyuki; Higashi, Kunio. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Experimental studies on radiation-induced traps for deuterium were conducted. Iron samples were pre-bombarded with 0.8-MeV ^{3}He ions and deuterium concentration was in-situ observed at elevated temperatures using the nuclear reaction $D(^3He,p)^4He$. The depth profiles of the trapped deuterium were similar to the distributions of the displaced host atoms. The trapping energy which is defined by a difference in the enthalpies between the trapped and the dissolved deuterium was 0.36eV. (author).

17250 (INIS-JP–029, pp. 72-74) **Study on performance of solid breeder materials of fusion reactor.** Magari, Tadashi (Kyoto Univ. (Japan). Faculty of Engineering); Nagae, Teruhito; Miyashita, Yousuke; Moritani, Kimikazu; Ito, Yasuhiko; Moriyama, Hirotake. Kyoto Univ. (Japan). Faculty of Engineering. Jul 1994. 163p. (In Japanese). In *Annual report of Radiation Laboratory Department of Nuclear Engineering Kyoto University for fiscal 1993.* Order Number DE95709896. Source: OSTI; NTIS; INIS.

Irradiation defects are important for the tritium recovery performance of fusion reactor solid breeder materials under irradiation. In the present study, tritium recovery experiments were performed with neutron-irradiated Li_2SiO_3 and Li_4SiO_4 samples. Irradiation defects were observed to affect the tritium behavior on Li_2SiO_3 more than Li_4SiO_4 and most of the released tritium was recovered as condensable form, HTO. (author).

17251 (INIS-mf–14480) **ITER EDA Newsletter. V. 3, no. 10.** International Atomic Energy Agency, Vienna (Austria). Oct 1994. 8p. Order Number DE95628425. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue reports on (i) the ITER-relevant statements made at the occasion of the 15th IAEA fusion conference in Seville, Spain, September 26 - October 1, 1994; (ii) a comprehensive technical presentation of the ITER EDA developments at the same conference; (iii) the first Workshop of the ITER Expert Group on Confinement and Transport, held at the San Diego Joint Work Site on 22-25 August 1994; and (iv) the visit to the San Diego Work Site of the representatives of a local philanthropic group, the ARCS Foundation (Achievement Rewards for College Scientists).

17252 (INIS-mf–14481) **ITER EDA Newsletter. V. 3, no. 11.** International Atomic Energy Agency, Vienna (Austria). Nov 1994. 8p. Order Number DE95628426. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue reports on (i) the third Technical Meeting on Safety and Environment held at the San Diego Joint Work Site, October 10-14, 1994; (ii) the ITER Expert Group Meeting on Disruptions, Plasma Control and MHD, held in Seville, Spain, September 29-30, 1994; in addition to a brief contribution on aspects of family life for foreigners at the Naka Joint Work Site.

17253 (INIS-mf–14482) **ITER EDA Newsletter. V. 3, no. 12.** International Atomic Energy Agency, Vienna (Austria). Dec 1994. 8p. Order Number DE95628427. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue reports on (i) the seventh Meeting of the Technical Advisory Committee (TAC-7) held at the Joint Work Site in Naka, Japan, 5-7 December 1994; (ii) the seventh Meeting of the ITER Management Advisory Committee (MAC-7) held at the Naka Joint Work Site, November 30 - December 1, 1994; (iii) the Magnet Technical Meeting, held at the Naka Joint Work Site on November 8-11, 1994.

17254 (INIS-mf–14503) **ITER EDA Newsletter. V.4, no.1.** International Atomic Energy Agency, Vienna (Austria). Jan 1995. 8p. Order Number DE95627420. Source: OSTI; NTIS (US Sales Only); INIS.

This ITER EDA (Engineering Design Activities) Newsletter issue reports on (i) the seventh ITER Council Meeting held at the Naka Joint Work Site on 14-15 December 1994, (ii) the "Confinement Modelling and Database Expert Group Workshop" held in Seville, Spain, 3-4 October 1994, and (iii) the first meeting of the International Organizing Committee for the Seventh International Fusion Reactor Materials Conference.

17255 (LA-UR–95-1057) **A self-assaying tritium storage bed for ITER.** Nasise, J.E.; Walthers, C.R.; Basinger, R.W. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950506–4: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95009498. Source: OSTI; NTIS; INIS; GPO Dep.

A safe metal-hydride "self-assaying" tritium storage bed, featuring accurate tritium assaying measurements is being designed, built, and tested at the Tritium Systems Test Assembly (TSTA) at the Los Alamos National Laboratory (LANL) for the International Thermonuclear Experimental Reactor (ITER) program. Time consuming inventory operations can be shortened by utilizing "self-assaying" tritium storage beds. Design considerations, calculations, problems, and construction details of the bed are presented. Sensitivity, predictability, and simplicity are optimized in this design by utilizing thermal radiation as the primary mode of heat transfer. Thermal analysis calculations have shown that the design may provide 15 times the ITER required sensitivity at full capacity of 150 gT.

17256 (LA-UR–95-1089) **Demonstration of "regulatory" process controls on the TSTA cryogenic distillation system.** Willms, R.S.; Sherman, R.H.; Cole, S.P.; Riggs, J.B.; Okuno, K. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950506–5: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95009494. Source: OSTI; NTIS; INIS; GPO Dep.

Due to the nature of its fusion reaction, most of the DT used to fuel the International Thermonuclear Experimental Reactor (ITER) will exit unreacted. This effluent will be purified by the fuel cleanup system so that the isotope separation system (ISS) will be fed only hydrogen isotopes and possibly some helium. The ISS will separate this feed into streams nominally composed of He/H2/HD, D2, DT, and T2. These products will be recycled through appropriate fueling systems back to the fusion reactor or returned to storage. The ISS will have to respond properly to feed conditions which change rapidly. Feed changes will propagate quickly through the entire cascade. It is apparent that an automatic control system will be required to respond to these changes and maintain product quality. It is convenient to divide such a distillation control system into 'regulatory' controls and composition controls. The 'regulatory' controls include liquid levels, flowrates, reboiler heats, and pressure. A system of regulatory controls has been devised and installed on the four-column cascade of cryogenic columns at the Tritium Systems Test Assembly (TSTA) at Los Alamos National Laboratory. This tritium-compatible ISS is designed for approximately 1/10 the ITER flowrate and is dedicated to fusion fuel studies. Details of the TSTA ISS have been published previously.

17257 (LA-UR–95-1110) **Basic science with pulsed power & some off-the-wall ideas.** Solem, J.C. Los Alamos National Lab., NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9504132–1: Spring workshop on basic science using pulsed power, Santa Barbara, CA (United States), 5-7 Apr 1995). Order Number DE95009486. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses aspects of pulsed power for use in basic research, with a principal emphasis on ATLAS, a planned 36-MJ pulsed-power machine with a circular architechture designed primarily for z-pinch implosion of cylindrical foils. The objective of the paper is to give an overview and touch on subjects which might test the limits of this technology.

17258 (NIFS-MEMO–14) **Proceedings of symposium on technology in laboratories (fiscal 1993) by department of engineering and technical services.** National Inst. for Fusion Science, Nagoya (Japan). Jul 1994. 327p. (In Japanese). (CONF-9403219–: Symposium on technology in laboratories, Toki (Japan), 23-24 Mar 1994). Order Number DE95768203. Source: OSTI; NTIS; INIS.

The Symposium on Technology in Laboratories was held on March 23 and 24 at Ceratopia Toki, and Toki Chamber of Commerce and Industry in Toki city, Gifu Prefecture, Japan. This symposium was hosted by National Institute for Fusion Science (NIFS). There were 273 participants from many Japanese universities and laboratories, from some Japanese industrial world. Seventy eight papers were presented in the symposium. Technical experience and new techniques were reported and discussed being divided into five sessions; technologies of fabrication, cryogenics, diagnostic and control system, computer and experimental apparatus. (author).

17259 (PNL-SA–25648) **Clean steels for fusion.** Gelles, D.S. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9503118–1: Clean steel-supper clean steel conference, London (United Kingdom), 6-7 Mar 1995). Order Number DE95008939. Source: OSTI; NTIS; INIS; GPO Dep.

Fusion energy production has an inherent advantage over fission: a fuel supply with reduced long term radioactivity. One of the leading candidate materials for structural applications in a fusion reactor is a tungsten stabilized 9% chromium Martensitic steel. This alloy class is being considered because it offers the opportunity to maintain that advantage in the reactor structure as well as provide good high temperature strength and radiation induced swelling and embrittlement resistance. However, calculations indicate that to obtain acceptable radioactivity levels within 500 years after service, clean steel will be required because the niobium impurity levels must be kept below about 2 appm and nickel, molybdenum, nitrogen, copper, and aluminum must be intentionally restricted. International efforts are addressing the problems of clean steel production. Recently, a 5,000 kg heat was vacuum induction melted in Japan using high purity commercial raw materials giving niobium levels less than 0.7 appm. This paper reviews the need for reduced long term radioactivity, defines the advantageous properties of the tungsten stabilized Martensitic steel class, and describes the international efforts to produce acceptable clean steels.

17260 (PPPL-CFP–3205) **Tritium analysis at TFTR.** Voorhees, D.R.; Rossmassler, R.L.; Zimmer, G. Princeton Univ., NJ (United States). Plasma Physics Lab. [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-950506–6: 5. topical meeting on tritium technology in fission, fusion and isotopic applications, Ispra (Italy), 28 May - 3 jun 1995). Order Number DE95009625. Source: OSTI; NTIS; INIS; GPO Dep.

The tritium analytical system at TFRR is used to determine the purity of tritium bearing gas streams in order to provide inventory and accountability measurements. The system includes a quadrupole mass spectrometer and beta scintillator originally configured at Monsanto Mound Research Laboratory in the late 1970's and early 1980's. The system was commissioned and tested between 1991 and 1992 and is used daily for analysis of calibration standards, incoming tritium shipments, gases evolved from uranium storage beds and measurement of gases returned to gas holding tanks. The low resolution mass spectrometer is enhanced by the use of a metal getter pump to aid in resolving the mass 3 and 4 species. The beta scintillator complements the analysis as it detects tritium bearing species that often are not easily detected by mass spectrometry such as condensable species or hydrocarbons containing tritium. The instruments are controlled by a personal computer with customized software written with a graphical programming system designed for data acquisition and control. A discussion of the instrumentation, control systems, system parameters, procedural methods, algorithms, and operational issues will be presented. Measurements of gas holding tanks and tritiated water waste streams using ion chamber instrumentation are discussed elsewhere.

17261 (PPPL-CFP–3206) **Tokamak Physics Experiment (TPX) power supply design and development.** Neumeyer, C. (Raytheon Engineers and Constructors, Princeton, NJ (United States). EBASCO Div.); Bronner, G.; Lu, E.; Ramakrishnan, S. Princeton Univ., NJ (United States). Plasma Physics Lab. [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-9504138–2: International power electronics conference, Yokohama (Japan), 3-7 Apr 1995). Order Number DE95009624. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Physics Experiment (TPX) is an advanced tokamak project aimed at the production of quasi-steady state plasmas with advanced shape, heating, and particle control. TPX is to be built at the Princeton Plasma Physics Laboratory (PPPL) using many of the facilities from the Tokamak Fusion Test Reactor (TFTR). TPX will be the first tokamak to utilize superconducting (SC) magnets in both the toroidal field (TF) and poloidal field (PF) systems. This new feature requires a departure from the traditional tokamak power supply schemes. This paper describes the plan for the adaptation of the PPPL/FTR power system facilities to supply TPX. Five major areas are addressed, namely the AC power system, the TF, PF and Fast Plasma Position Control (FPPC) power supplies, and quench protection for the TF and PF systems. Special emphasis is placed on the development of new power supply and protection schemes.

17262 (PPPL-CFP–3231) **Segmentation strategies for the irradiated and tritium contaminated PPPL TFTR.** Walton, G.R. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Litka, T.J.; Spampinato, P.T. Princeton Univ., NJ (United States). Plasma Physics Lab. 9 Feb 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-950414–1: American power conference, Chicago, IL (United States), 18-20 Apr 1995). Order Number DE95009626. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Fusion Test Reactor (TFTR) at Princeton Plasma Physics Laboratory is scheduled to complete its final experiments in the Fall of 1995. As a result, the TFTR will be activated and tritium contaminated. After the experiments are complete, the TFTR will undergo Shutdown and Removal (S and R). The space vacated by the TFTR will be used for a new test reactor, the Tokamak Physics Experiment (TPX). Remote methods may be required to remove components and to segment the Vacuum Vessel. The TFTR has been studied to determine alternatives for the segmentation of the Vacuum Vessel from the inside (In-Vessel). The methodology to determine suitable strategies to segment the Vacuum Vessel from In-Vessel included several areas of concentration. These areas were segmentation locations, cutting/removal technologies, pros and cons, and cutting/removal technology delivery systems. The segmentation locations for easiest implementation and minimal steps in cutting and removal have been identified. Each of these will also achieve the baseline for packaging and shipment. The methods for cutting and removal of components were determined. In addition, the delivery systems were conceptualized.

17263 (SAND–94-0282C) **Target diagnostics for intense lithium ion hohlraum experiments on PBFA II.** Leeper, R.J. (and others); Bailey, J.E.; Carlson, A.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940552–35: 10. topical conference on high-temperature plasma diagnostics, Rochester, NY (United States), 8-12 May 1994). Order Number DE95008517. Source: OSTI; NTIS; INIS; GPO Dep.

A review of the diagnostics used at Sandia National Laboratories to measure the parameters of intense lithium ion-beam hohlraum target experiments on PBFA II will be presented. This diagnostic package contains an extensive suite of x-ray spectral and imaging diagnostics that enable measurements of target temperature and x-ray output. The x-ray diagnostics include time-integrated and time-resolved pinhole cameras, energy-resolved I-D streaked imaging, diagnostics, time-integrated and time-resolved grazing, incidence spectrographs, a transmission grating spectrograph, an elliptical crystal spectrograph, a bolometer array, an eleven-element x-ray diode (XRD) array, and an eleven-element PIN diode detector array. The incident Li beam symmetry and an estimate of incident Li beam power density can be measured from ion beam-induced characteristic x-ray line emission and neutron emission.

17264 (SAND–95-0116) **Workshop on transport for a common ion driver.** Olson, C.C. (Sandia National Labs., Albuquerque, NM (United States)); Lee, E.; Langdon, B. Sandia National Labs., Albuquerque, NM (United States). [1994]. 447p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409304–: Workshop on transport for a common ion driver, Albuquerque, NM (United States), 20-21 Sep 1994). Order Number DE95007298. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains research in the following areas related to beam transport for a common ion driver: multi-gap acceleration; neutralization with electrons; gas neutralization; self-pinched transport; HIF and LIF transport, and relevance to common ion driver; LIF and HIF reactor concepts and relevance to common ion driver; atomic physics for common ion driver; code capabilities and needed improvement.

17265 (UCRL–52000-94-12) **Energy & Technology Review, December 1994.** Bookless, W.A.; Wheatcraft, D. (eds.). Lawrence Livermore National Lab., CA (United States). Dec 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE9501u261. Source: OSTI; NTIS; GPO Dep.

This issue of the review is devoted to articles on the proposed National Ignition Facility. This facility is proposed to achieve ignition via laser driven inertial confinement, and energy gain, for the first time in a laboratory plasma device. Separate articles from this issue have been indexed into the database.

17266 (UCRL-JC–116966) **Stability analysis of the TPX toroidal field coil.** Wong, R.L. Lawrence Livermore National Lab., CA (United States). 13 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941013–33: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95009666. Source: OSTI; NTIS; INIS; GPO Dep.

The energy stability margin of the TPX/TF conductor has been calculated as a response to heat pulses with short initial quench zones and with long initial quench zones. The short IQZs approximate ramp-rate induced heating, and the long IQZs approximate heating from a plasma disruption. These IQZs are centered in the bore inner leg of the double pancake, where the operating field and temperature are maximum. Energy margin stability curves are plotted as a function of current. At the 33.5 kA design current, the minimum calculated stability margin with short IQZs is 390 mJ/cc. The minimum calculated stability margin with long IQZs is 205 mJ/cc. A comparison the stability margin with the available enthalpy (short IQZs) and with the available internal energy (long IQZs) shows that the conductor utilizes the available helium energy well. The energy margin stability curve is generally divided into two regions. The regions can be characterized on the basis of a decrease or an increase in heating after the initiating heat pulse during a marginal quench. The low current well-cooled region exists when the heating rate during the pulse is greater than the Joule heating after the pulse. Since the heating rate decreases, the energy margin is high. The high current ill-cooled region exists when the heating rate during the pulse is less than the Joule heating after the pulse. Since the heating rate increases, the energy margin is low. In the evaluation of a well-cooled or an ill-cooled condition, this Joule heating should be included in the strength of the initiating pulse. When this is done for the TPX/TF conductor, the limiting current approaches the critical current, explaining why the stability curves are entirely in the well-cooled region. The important result is that the conductor does not exhibit a large decrease in energy margin to an ill-cooled region until the current approaches the critical current.

17267 (UCRL-JC–119070) **The HYLIFE-II inertial fusion energy power plant concept and implications for IFE.** Moir, R.W. Lawrence Livermore National Lab., CA (United States). 4 Nov 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941101–10: Meeting of the Division of Plasma Physics of the American Physical Society,

Minneapolis, MN (United States), 7-11 Nov 1994). Order Number DE95010561. Source: OSTI; NTIS; INIS; GPO Dep.

HYLIFE-II is based on nonflammable, renewable-liquid-wall fusion target chambers formed with Li_2BeF_4 molten-salt jets, a heavy-ion driver, and single-sided illumination of indirect-drive targets. Building fusion chambers from existing materials with life-of-plant structural walls behind the liquid walls, while still meeting non-nuclear grade construction and low-level waste requirements, has profound implications for IFE development. Fluid-flow work and computational fluid dynamics predict chamber clearing adequate for 6-Hz pulse rates. Predicted electricity cost is reduced about 30% to 4.4 cents/kWh at 1 GWe. Development can be foreshortened and cost reduced by obviating expensive neutron sources to develop first-wall materials. The driver and chamber can be upgraded in stages, avoiding separate and sequential facilities. The most important features of a practical inertial fusion power plant are sufficient ignition and gain in targets; a low-cost, efficient, repratable driver; and low-cost targets.

17268 (UCRL-JC–119584) **Can inertial electrostatic confinement work beyond the ion-ion collisional time scale?.** Nevins, W.M. Lawrence Livermore National Lab., CA (United States). Jan 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950170–2: DOE/EPRI workshop on the physics of spherical continuous inertial fusion, Santa Fe, NM (United States), 12-14 Jan 1995). Order Number DE95009530. Source: OSTI; NTIS; INIS; GPO Dep.

Inertial electrostatic confinement systems are predicated on a non-equilibrium ion distribution function. Coulomb collisions between ions cause this distribution to relax to a Maxwellian on the ion-ion collisional time-scale. The power required to prevent this relaxation and maintain the IEC configuration for times beyond the ion-ion collisional time scale is shown to be at least an order of magnitude greater than the fusion power produced. It is concluded that IEC systems show little promise as a basis for the development of commercial electric power plants.

17269 (UCRL-JC–120076) **Measurements of stability margins and current distribution in large-scale Nb_3Sn cable-in-conduit conductors.** Shen, S.S. (Lawrence Livermore National Lab., CA (United States). Applied Superconductivity Group); Isono, Takaaki. Lawrence Livermore National Lab., CA (United States). 7 Mar 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9503127–2: 9. US/Japan workshop on high-field superconducting materials, Kyoto (Japan), 11-16 Mar 1995). Order Number DE95009869. Source: OSTI; NTIS; INIS; GPO Dep.

The main goal of the ITER Conductor Testing Program is to validate the design and the fabrication process of the CICC (Cable-In-Conduit Conductor) and its joints, in full-size samples. For testing large-scale cable-in-conduit conductors, several practical experimental techniques have been developed to specifically address the issues of conductor stability. The following described techniques enable experimentalists to quantify the effects and thus provide useful tools to improve the conductor performance in magnet applications. In this paper, the authors, present two experimental techniques: (a) stability margin calibration and (b) current distribution. Both are much needed in the laboratory for testing the conductor stability.

17270 (UCRL-LR–117512) **Reflectivity of plasmas created by high-intensity, ultra-short laser pulses.** Gold, D.M. Lawrence Livermore National Lab., CA (United States). Jun 1994. 225p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95009536. Source: OSTI; NTIS; GPO Dep.

Experiments were performed to characterize the creation and evolution of high-temperature ($T_e \sim 100eV$), high-density ($n_e > 10^{22} cm^{-3}$) plasmas created with intense ($\sim 10^{12}$-$10^{16} W/cm^2$), ultra-short (130fs) laser pulses. The principle diagnostic was plasma reflectivity at optical wavelengths (614nm). An array of target materials (Al, Au, Si, SiO_2) with widely differing electronic properties tested plasma behavior over a large set of initial states. Time-integrated plasma reflectivity was measured as a function of laser intensity. Space- and time-resolved reflectivity, transmission and scatter were measured with a spatial resolution of $\sim 3\mu m$ and a temporal resolution of 130fs. An amplified, mode-locked dye laser system was designed to produce ~3.5mJ, ~130fs laser pulses to create and nonintrusively probe the plasmas. Laser prepulse was carefully controlled to suppress preionization and give unambiguous, high-density plasma results. In metals (Al and Au), it is shown analytically that linear and nonlinear inverse Bremsstrahlung absorption, resonance absorption, and vacuum heating explain time-integrated reflectivity at intensities near $10^{16} W/cm^2$. In the insulator, SiO_2, a non-equilibrium plasma reflectivity model using tunneling ionization, Helmholtz equations, and Drude conductivity agrees with time-integrated reflectivity measurements. Moreover, a comparison of ionization and Saha equilibration rates shows that plasma formed by intense, ultra-short pulses can exist with a transient, non-equilibrium distribution of ionization states. All targets are shown to approach a common reflectivity at intensities $\sim 10^{16} W/cm^2$, indicating a material-independent state insensitive to atomic or solid-state details.

17271 (UTNL-R–0302, pp. 1-8) **Effect of electromagnetic forces during disruptions in JT-60U vacuum vessel.** Neyatani, Y. (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Ushigusa, K.; Matsukawa, M.; Ninomiya, H. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

Since the JT-60 Upgrade (JT-60U) has a toroidally continued vacuum vessel with the small toroidal resistivity of 160 $\mu\Omega$, a large toroidal eddy current was predicted during disruptions. The toroidal current was measured directly and the behavior of the plasma and the eddy current were studied in the current quench phase. In the current quench phase, the fastest current decay is $Ip/(dIp/dt)_{MAX} \approx 5$ ms. The maximum toroidal eddy current is ≈40% of the plasma current which fits the design value and it increases linearly with Ip. Maximum total electromagnetic force of the vacuum vessel was radially 750 tons and vertically 120 tons with the inward motion of plasma in a 4MA disruption. The vibration of the vacuum vessel was measured during disruptions to estimate the electromagnetic forces and the stress of the vacuum vessel. The maximum amplitude of the vessel vibration increases with Ip^2. From this scaling, an amplitude at 6 MA disruption is expected to be 1.3 mm that is within the design limit of 2 mm. The poloidal halo current was observed at the simulation of the vertical displacement event. The time evolution of the halo current is consistent the estimated poloidal voltage produced by the plasma motion. The halo current increases with Ip and seems to increase with B_T. The maximum rate of halo current reaches ≈60% of the initial plasma current in the case of 1 MA disruption. The electromagnetic force due to halo current is ≈150 tons for vacuum vessel and ≈60kg for divertor tile. (author).

17272 (UTNL-R–0302, pp. 21-32) **Electromagnetic force on coils of the large helical device.** Imagawa, S. (National Inst. for Fusion Science, Nagoya (Japan)); Hayashi, H.; Tamura, H.; Nishimura, A.; Satow, T.; Yamamoto, J.; Motojima, O. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

Estimation of electromagnetic force on coils and structural analyses by finite element method have been carried out for the Large Helical Device, which is a heliotron/torsatron-type fusion experimental device under construction. It has one pair of superconducting helical coils and three pairs of superconducting poloidal coils. The electromagnetic forces loaded on the coils are in the order of 10 MN/m. Accuracy of the position of the coils is very

important for the helical device to realize good magnetic configuration. All coils, therefore, are firmly fixed to a cylindrical supporting structure. In order to suppress the error field within $1x10^{-4}$ of the central toroidal field, it was provided that the asymmetric deformation of each coil caused by electromagnetic force should be within 3.4 mm for 4 T operation. After reformation of the thickness and the shape of the supporting structures according to the results of rough structural analyses, the detailed structural analysis with considering the rigidness of poloidal coils has been carried out. The maximum displacement of the supporting structures is calculated to be 2.39 mm. The maximum stress intensity is calculated to be 264 MPa. These satisfy allowable values. (author).

17273 (UTNL-R–0302, pp. 33-44) **R and D on the magnetomechanical analysis and design of tokamak blanket structures using combined numerical/experimental techniques.** Crutzen, Y. (Commission of the European Communities, Ispra (Italy). Joint Research Centre); Sakellaris, I. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

The design of the in-vessel components requires the verification of their structural thermal/mechanical and nuclear performances, and the validation of the solution of support systems to the vessel. But, the transient electromagnetic (EM) loads, caused by rapid variation of magnetic fields, e.g. during disruptions, in these structures surrounding the plasma ring, represent significant design factors. One of the major issues in fusion with magnetic confinement remains the study of these EM forces. The TESLA Laboratory of the JRC Ispra contributes, both theoretically and experimentally, to the European studies for the technical feasibility and acceptability of next step, e.g. ITER, and the commercial fusion reactors. The present paper describes the recent research and development (R and D) activities with regard to magnetomechanical behaviour of shield/blanket structures. (author).

17274 (UTNL-R–0302, pp. 45-56) **Review of past experiments at the FELIX facility and future plans for ITER applications.** Hua, T.Q. (Argonne National Lab., IL (United States)); Turner, L.R. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

FELIX is an experimental test facility at Argonne National Laboratory (ANL) for the study of electromagnetic effects in first wall, blanket, shield systems of fusion reactors. From 1983 to 1986 five major test series, including static and dynamic tests, were conducted and are reviewed in this paper. The dynamic tests demonstrated an important coupling effect between eddy currents and motion in a conducting structure. Recently the U.S. has proposed to the ITER Joint Central Team to use FELIX for testing mock-up components to study electromagnetic effects encountered during plasma disruptions and other off-normal events. The near and long term plans for ITER applications are discussed. (author).

17275 (UTNL-R–0302, pp. 57-68) **Electromagnetic analysis of first wall and blanket in NET and ITER-CDA.** Albanese, R. (Salerno Univ. (Italy). Ist. di Ingegneria Elettronica); Martone, R.; Bottura, L.; Chiocchio, S.; Coccorese, E.; Portone, A.; Rubinacci, G. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

Structure and features of three codes (NAPS, PROTEUS and CARIDDI) developed for design and analysis related to electromagnetic transients and plasma engineering are briefly reviewed. Some applications concerning first wall and blanket are presented, and general conclusions regarding the engineering and modelling of these components are drawn. (author).

17276 (UTNL-R–0302, pp. 69-79) **Numerical study on effect of magnetic field direction on flow behavior of metal melted by high heat flux.** Teramoto, Tokuo (Tsukuba Univ., Ibaraki (Japan)); Nagai, Takahiro; Ishiguro, Hiroshi. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

On plasma disruption a huge electromagnetic force is mechanically applied to the first wall etc. since the high eddy current is generated through vanishing of poloidal magnetic field. Besides, the first wall can be melted in part by high heat flux irradiation and the melted zone created is affected by the strong magnetic field. In the present paper, as actual case, it is investigated how a direction of applied magnetic field affects the development, the flow behavior and the temperature distribution of melted zone. An attempt is also made to correlate the flow behavior with magnetic field parameter. The following results are obtained. (1) The flow pattern in the melted zone is non-symmetric about center axis if the magnetic field is applied in a diagonal direction. This aspect is surely observed for a strong magnetic field. (2) The configuration of the melted zone by an application of weak magnetic field is close to that due to non-magnetic field while the configuration by an application of strong magnetic field is almost same as that due to heat conduction alone, i.e., neglect of convection. Both configurations, however, seem to be independent of applied direction. (3) In the case of weak magnetic field, the distributions of surface velocity and surface temperature are mostly dependent on applied direction while, in the case of strong magnetic field, they are not much affected by applied direction. (4) After a short time after high heat flux irradiation, the maximum surface velocity is inversely proportional to the square of the Hartmann number expressed in term of vertical component of magnetic field. (J.P.N.).

17277 (UTNL-R–0302, pp. 161-168) **Experimental and numerical analyses for effects of ferromagnetic material.** Tsuchimoto, M. (Hokkaido Univ., Sapporo (Japan). Faculty of Engineering); Oohira, T.; Hashimoto, M.; Takagi, T.; Miya, K. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

In strong and fluctuating magnetic field of a fusion reactor, ferromagnetic material receives magnetic body force as a result of magnetization. Experimental and numerical studies are explained to evaluate effects of ferromagnetic material. The magnetic torque for a ferromagnetic beam plate is analyzed for a ferromagnetic first wall. Iron loss and mechanical vibrations are also investigated for a ferromagnetic thin plate. (author).

17278 (UTNL-R–0302, pp. 169-177) **Electromagnetic forces computation for a ferromagnetic blanket structure during a plasma disruption.** Ruatto, P. (Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik). Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other*

structures surrounding the fusion plasma torus. 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

The choice of a martensitic steel (MANET) as the best candidate for the Demo blanket structural material entails a critical issue concerning its behaviour in presence of electromagnetic fields. In fact, MANET is a ferromagnetic material with a nonlinear magnetic behaviour followed by saturation of the magnetization. Its presence near the plasma region alter the distribution of the magnetic fields inside and outside the blanket structure in such a way that during a plasma disruption, as eddy currents are induced in the blanket structure, strong electromagnetic forces rise, which could seriously damage the blanket. A code which accounts for the presence of a saturated magnetic blanket structural material is being developed. It consists of a three dimensional program based on an integral volume method and using edge and constant elements for the calculation of eddy current and magnetization respectively. Analytical and numerical approach of the code are presented as well as the results of calculations performed for the KfK BOT Solid Breeder Blanket. (author).

17279 (UTNL-R–0302, pp. 189-200) **Fracture mechanics assessment of the Karlsruhe DEMO Blanket during plasma disruptions.** Boccaccini, L.V. (Kernforschungszentrum Karlsruhe GmbH (Germany). Institut fuer Neutronenphysik und Reaktortechnik). Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

The martensitic steel MANET has been chosen as structural material for the Karlsruhe DEMO Blanket Design. The main reason for this choice was that MANET is able to withstand the high neutron fluence in DEMO (70 d.p.a.) without swelling appreciably. Nevertheless, the fracture toughness behaviour of the material degrades considerably under irradiation especially at irradiation temperatures less than 400degC. As the minimum operating temperatures of the blanket structural material are just in the range between 300degC and 400degC, it is necessary to calculate the effects of plasma disruptions, in which a large amount of mechanical energy is discharged in few milliseconds into the blanket structure. The present paper shows procedures and results of a fracture mechanics assessment for the Karlsruhe Demo Solid Breeder Blanket Design. Local stress intensity factors K_I have been calculated for a first wall section in which the stresses are the highest. Comparing the K_I with the dynamic fracture toughness of the irradiated material, a critical crack dimension of 2.2 mm has been calculated. (author).

17280 (UTNL-R–0302, pp. 201-209) **Influence of static magnetic field on fatigue life.** Misumi, Masaaki (Seikei Univ., Musashino, Tokyo (Japan)); Ohkubo, Masafumi. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

The crack growth rate in a central notched carbon steel plate was not affected by static magnetic field under cyclic tension fatigue, but under reversed torsional fatigue some decrease of fatigue life was clearly observed in a static magnetic field for carbon steel bar. The decrease of fatigue life changed with specimen configuration, temperature, shear stress amplitude, specimen support condition. The additional tensile stress which gave almost same decrease of torsional fatigue life in the magnetic field was confirmed experimentally to be 20-50 MPa. The magnetostriction of tested steel was shrinkage in the longitudinal direction and elongation in the circumferential direction, and the volume magnetostriction was zero in this experimental condition. Some shift of fracture appearance to that of higher stress level were observed in a magnetic field: it would suggest a shear stress increase by the magnetic moment due to the Wertheim effect in which a circumferential magnetic field appears in a longitudinally magnetized bar when twisted. (author).

17281 (UTNL-R–0302, pp. 231-242) **Research on structural design guideline for the experimental fusion reactor.** Miya, K. (Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab.); Muto, Y.; Takatsu, H.; Hada, K.; Aoto, K.; Shiraishi, H.; Shimakawa, T. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

Research works to prepare a structural design guideline have been conducted based on the CDA-design of ITER. Though many further discussions are necessary, the present interim contents were described as follows. (1) Tritium boundary structures and the structures mitigating the effect of tritium-release accident are classified into a fusion class 1, which corresponds to the classes 3 or 4 in the Notification No.501. (2) Concerning the calculation of EM force, mesh generation associated with the skin effect and dynamic effect are major issues. (3) A simplified finite element model for the seismic calculation was presented. (4) Probable failure modes were listed up. (5) Concerning the issue of low ductility of 316 SS due to the irradiation, experiments to examine the validity of tearing modulus criterion, analytical methods to examine the applicability of the stress basis allowable stress limits to such a material were introduced. (6) The subjects related to the structural integrity evaluation for the EM loading such as the values of fracture toughness and the stress classification were described. (7) The results of analyses to develop simplified analysis methods for the buckling of the torus vacuum vessel under the outer pressure and for the buckling of rectangular bellows under the internal/external pressure were shown. (8) Concerning welding and nondestructive tests, issues pertaining to the vacuum vessel, blanket and divertor cooling tube were discussed. (J.P.N.).

17282 (UTNL-R–0302, pp. 243-250) **Application of shape memory alloy to a fusion structure component. A proposal of intelligent material system.** Furuya, Y. (Tohoku Univ., Sendai (Japan). Faculty of Engineering); Takagi, T.; Matsumoto, M.; Tani, J. Tokyo Univ., Tokai, Ibaraki (Japan). Nuclear Engineering Research Lab. 1993. (CONF-9309405–: 2. international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus, Tokai (Japan), 15-17 Sep 1993). In *Proceedings of the 2nd international workshop on electromagnetic forces and related effects on blankets and other structures surrounding the fusion plasma torus.* 291p. Order Number DE94792667. Source: OSTI; NTIS; INIS.

1. We have proposed a new material structure system for use as structure components of a magnetic fusion reactor. (a) This system is composed of metal matrix and shape memory alloy (SMA) fiber. (b) Because of intelligent properties of SMA, this material could be an adaptive structure component against a plasma disruption. 2. In order to utilize this system as fusion structure components, the following items should be clarified: (a) High performance SMA, (b) Fabrication technique, (c) Compatibility with metal matrix, (d) Neutron irradiation, (e) Material properties, (f) Mechanical behavior. (J.P.N.).

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17283 (DOE/EIA–0546(94)) **Energy education resources. Kindergarten through 12th grade.** National Energy Information Center, Washington, DC (United States). 17 Feb 1995. 93p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95008208. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This publication is the result of a study undertaken by the National Energy Information Center (NEIC), a service of the Energy Information Administration (EIA), to provide its customers with a list of generally available free or low-cost energy-related educational

materials for students and educators. The list is updated once a year.

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Refer also to citation(s) 14983, 15681, 16678, 16841, 16853, 17413, 17417, 17422, 17425, 17426, 17427

17284 (CEA-DETN-RA–1994) **Annual report 1994.** CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France). Dept. d'Etudes et de Technologies Nucleaires. 1995. 80p. (In French). Order Number DE95627108. Source: OSTI; NTIS (US Sales Only); INIS.

This annual report of the DETN (Studies and Nuclear Technologies Department) is divided into five parts bearing on: (1)magnetic materials elaboration, (2)microstructural characterization of carbon composites, hexagonal ferrites and actinides alloys, (3)laser welding, (4)materials control by ultrasonic testing or by analytical chemistry, (5)numerical modelization.

17285 (DOE-HDBK–1086-95) **Table-top training program design.** USDOE, Washington, DC (United States). Apr 1995. 293p. Sponsored by USDOE, Washington, DC (United States). (FSC–6910). Order Number DE95011251. Source: OSTI; NTIS; GPO Dep.

This handbook establishes general training program guidelines for training personnel in developing training for operation, maintenance, and technical support personnel at DOE nuclear facilities.

17286 (DOE/HR–0130) **Directory of potential subcontracting opportunities at Headquarters Procurement Operations.** USDOE Office of Procurement, Assistance and Program Management, Washington, DC (United States). Headquarters Procurement Operations. Mar 1995. 5p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95010696. Source: OSTI; NTIS; GPO Dep.

This booklet contains a listing of the Office of HQ Procurement Operations prime contractors required to implement a subcontracting plan in accordance with Public Law 95-507. It is intended to highlight potential subcontracting business opportunities for small business, small disadvantaged business, and woman-owned business firms.

17287 (DOE/IG–0369) **Report on inspection of Los Alamos National Laboratory's system for controlling cost overruns on work-for-others projects.** USDOE Office of Inspector General, Washington, DC (United States). Mar 1995. 28p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

The Office of Inspector General previously issued Report No. DOE/IG-0335, "Report on Inspection of Selected Intelligence and Special Access Program Work-for-Others Projects". In this report, the authors noted that Los Alamos National Laboratory had internal control weaknesses involving work-for-others projects. Because of these weaknesses and the Department's continued interest in work-for-other Federal agencies, the authors initiated this inspection. this particular inspection reviewed Los Alamos National Laboratory's for controlling cost overruns on, and ensuring financial integrity of, work-for-others projects. The authors also reviewed Albuquerque Operations Office's implementation of internal processes for monitoring costs and ensuring financial integrity for these work-for-others projects.

17288 (DOE-STD–7501-95) **Development of DOE lessons learned programs.** USDOE, Washington, DC (United States). May 1995. 47p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95011501. Source: OSTI; NTIS; GPO Dep.

Objective is to open lines of communication between DOE effective lessons-learned programs with minimal impact to existing processes and methods. Since the technical standard uses existing communication links, impact to resources should be minimal. Purpose of developing "lessons learned" is to share and use information to promote recurrence of desirable activities, or to preclude recurrence of undesirable activities. This technical standard is designed to facilitate the sharing of information in a consistent manner across the DOE complex.

17289 (GC–37/RES/DEC/1993) **Resolutions and other decisions of the General Conference. Thirty-seventh regular session. 27 September - 1 October 1993.** International Atomic Energy Agency, Vienna (Austria). May 1994. 57p. Order Number DE95628155. Source: OSTI; NTIS (US Sales Only); INIS.

The document reproduces the twenty-seven resolutions adopted and the fourteen other decisions taken by the IAEA General Conference at its thirty-seventh (1993) regular session. The resolutions are preceded by the agenda for the session.

17290 (HHS-CFR-B–7) **The development of risk acceptance and moral valuation.** Sjoeberg, L. (Stockholm School of Economics, Center for Risk Research, Stockholm (Sweden)); Torell, G. Stockholm School of Economics (Sweden). Center for Risk Research. Dec 1991. 21p. Order Number DE95627111. Source: OSTI; NTIS; INIS.

The relationship between acceptability of risk and moral valuation of risky activities was investigated in children, 10-16 years old. It was found that all age groups exhibited a strong correlation between the two dimensions of risky activities. Older children were more tolerant of risk taking than younger children. Individual actions were judged in a more lenient manner than collective actions. Girls tended to be more morally condemning towards risk taking, but the youngest girls were not less prone to accept risks than boys. General measures of moral development according to Piaget and Kohlberg were not associated with perceived acceptability of risk or the judged morality of risky activities but relations were found between risk taking and assertiveness and perceived freedom, which were the most important factors in accounting for risk and morality attitudes. 22 refs, 9 figs, 4 tabs.

17291 (HHS-CFR-B–8) **Center for risk research: A review of work 1988-1991.** Sjoeberg, L. Stockholm School of Economics (Sweden). Center for Risk Research. Jan 1992. 13p. Order Number DE95627112. Source: OSTI; NTIS; INIS.

This report gives a summary of the research published during the first 4 years of the Center for Risk Research at the Stockholm School of Economics. Risk research carried out so far at the Center has been concerned with mapping of attitudes and risk perceptions with regard to nuclear risks, AIDS, military flight risks, and economic risks. There has also been some methodological work and some work on the relationship between risk perception and interests.

17292 (IAEA-SM–317/12) **PCARRD's strategies for technology transfer: The agriculture and resources regional technology information system and the regional applied communication program.** Stuart, T.H. (Philippine Council for Agriculture, Los Banos, Laguna (Philippines). Forestry and Natural Resources); Mamon, C.R. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 20p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628891. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes the Agriculture and Resources Regional Technology Information System (ARRTIS) and the Regional Applied Communication Outreach Program (RAC) of PCARRD. The ARRTIS and the RACO are the strategies in communicating scientific and technology-based information. The ARRTIS is an information system that provides an information base on the status of technologies at various levels of maturity (generation, adaptation, verification, piloting, dissemination and utilization) and offers technology alternatives based on environmental requirements, costs and returns analysis or feasibility of the technologies. This information base provides the repository of technology information from which the Applied Communication Program draws its information for packaging into various formats, using various strategies/media to cater to various users in the regions most especially the farmers. Meanwhile, as PCARRD executes its mission of developing the national research system, it incorporates a development support communication program through the RACO. The RACO is essentially a working component of a regional research center/

consortium in each region coordinated by the Applied Communication Division of PCARRD. It aims at reaching farmers and their families, extensionists, administrators, policy makers and entrepreneurs with research information and technology which use a variety of appropriate communication channels, modern communication technology and strategies so that they may actively participate in research diffusion and utilization. (author). 7 refs.

17293 (IAEA-SM–317/16) **Multilingual access to full text databases.** Fluhr, C. (Institut National des Sciences et Techniques Nucleaires (INSTN), Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Radwan, K. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 11p. (In French). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628893. Source: OSTI; NTIS (US Sales Only); INIS.

Many full text databases are available in only one language, or more, they may contain documents in different languages. Even if the user is able to understand the language of the documents in the database, it could be easier for him to express his need in his own language. For the case of databases containing documents in different languages, it is more simple to formulate the query in one language only and to retrieve documents in different languages. This paper present the developments and the first experiments of multilingual search, applied to french-english pair, for text data in nuclear field, based on the system SPIRIT. After reminding the general problems of full text databases search by queries formulated in natural language, we present the methods used to reformulate the queries and show how they can be expanded for multilingual search. The first results on data in nuclear field are presented (AFCEN norms and INIS abstracts). 4 refs.

17294 (IAEA-SM–317/17) **European Community initiatives and experience in scientific and technical information.** Steven, G. (Commission of the European Communities, Luxembourg (Luxembourg)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 9p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628894. Source: OSTI; NTIS (US Sales Only); INIS.

Scientific and technical information (STI) is an increasingly important resource for R and D and industrial development. The rapid development of the market for electronic information and the increasing potential offered through new information technologies require new approaches for the collection and dissemination of STI. Activities of the Commission of the European Communities (CEC) in this area are reviewed. More recent CEC initiatives in the areas of biotechnology information and factual materials data banks have proved the need for international collaboration and for the implementation of infrastructural measures as a basis for such collaboration. The implementation of the EC Demonstrator Programme on materials property data systems has evaluated the potential of eleven European materials data banks against the market requirements and has helped to launch wide international collaboration. The concluding European workshop on materials data systems has developed a set of recommendations for future initiatives. These are shortly reviewed together with initial findings of a study aimed at developing a business plan for the establishment of a biotechnology information infrastructure for the bio-industries and research base in Europe. (author). 3 refs.

17295 (IAEA-SM–317/20) **The online age and the agricultural user education.** Yousif-Aballi, A.F. (Scientific Research Council, Baghdad (Iraq). Scientific Affairs Office). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 10p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628895. Source: OSTI; NTIS (US Sales Only); INIS.

Accelerated developments in the computer and telecommunication technologies have been well exploited in production and provision of information to meet needs of different groups of agricultural user population; however, in developing countries topmost computerized agricultural scientific and technical services available serve groups who by profession are scientists and academics. User education became of crucial importance for optimum utilization of information. General user educational requirement, particular user response and problems, information resources, services, and available facilities were taken into consideration in designing an information service training course for agricultural researchers, a detailed outline of the course is given in this paper as well as trainees and trainers evaluation. (author). 6 refs.

17296 (IAEA-SM–317/21) **Computerized integrated data base production system (COMPINDAS).** Marek, D. (Fachinformationszentrum Karlsruhe, Gesellschaft fuer Wissenschaftlich-Technische Information mbH, Eggenstein-Leopoldshafen (Germany)); Buerk, K. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 19p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628896. Source: OSTI; NTIS (US Sales Only); INIS.

Based on many years of experience, and with the main objective in mind to guarantee long-term database quality and efficiency of input processes, Fachinformationszentrum Karlsruhe is developing an integrated interactive data management systems for bibliographic and factual databases. Its concept includes the following range of applications: Subject analysis with computer-assisted classification, indexing and translation; technical procedures with online acquisition and management of literature and factual data, recording by means of optical scanning, computer-assisted bibliographic description, control and update procedures; support of the whole process by continuous surveillance of document flow. All these procedures will be performed in an integrated manner. They system is to meet high standards for flexibility, data integrity and effectiveness of system functions. Independent of the type of data, the appropriate database or the subject field to be handled, all data will be stored in one large pool. One main goal is to avoid duplication of work and redundancy of data storage. The system will work online, interactive and conversational. COMPINDAS is being established on the basis of the ADABAS as database management system for storage and retrieval. The applications are being generated by means of aDis of ASTEC in Munich. aDis is used for the definition of the data structures, checking routines, coupling processes, and the design of dialogue and batch routines including masks. (author). 7 figs.

17297 (IAEA-SM–317/23) **Industrial and technological information. Who has it and who needs it? The role of NTIS in acquisition and dissemination.** Khan, A.R. (National Technical Information Service (NTIS), Springfield, VA (United States). Office on International Affairs); Carroll, B.C. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 19p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628897. Source: OSTI; NTIS (US Sales Only); INIS.

Worldwide access to the results of research and development is critical for the effective advancement of science and its application. The U.S. National Technical Information Service (NTIS) has as its mission the collection and dissemination of scientific and technical

information (STI) produced worldwide, in order to increase U.S. competitiveness in the global economy. However, because of the interconnectedness of the world of science, NTIS also plays an important role in the world STI infrastructure. The paper describes the general STI transfer process, discusses the generators, products and services, and users of STI, and talks about the types of programs that have evolved to facilitate this process. The technical Report is highlighted as a significant information product. Finally, some future directions for NTIS to help meet the needs of users and acquire information more effectively are noted. In conclusion, the benefits and requirements for international cooperation and reciprocity are cited as cornerstones in building an effective worldwide STI infrastructure. (author). 7 figs.

17298 (IAEA-SM–317/27) **Structure and representation of data elements on factual database - SIST activity in Japan.** Nakamoto, H. (Integrated Researches for Information Science, Tokyo (Japan)); Onodera, N. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 7p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628898. Source: OSTI; NTIS (US Sales Only); INIS.

A factual database has a variety of forms and types of data structure that produces various kinds of records composed of a great number of data items, which differ from file to file. Second, a factual database needs higher speciality in preparation on content analysis, and users wish to process download-ed data successively for analysis, diagnosis, simulation, projecting, design, linguistic processing and so on. A meaningful quantitative datum can be divided into some consistent sub-elements. In addition to this fine structure of data elements, representation of data elements is also very important to integrate factual data on to public files. In this paper we shall discuss problems and thoughts about the structure and representation of data elements contained in numerical information on a practical basis. The guideline discussed here is under draft by sponsorship of the Government and is being implemented to build database of space experiments. The guideline involves expression, unification, notification and handling of data for numerical information in machine readable form, such as numerical value, numerical formula, graphics, semi-quantitative value, significant figures, ranged data, accuracy and precision, conversion of unit, semi-quantitative values, error information and so on. (author).

17299 (IAEA-SM–317/38) **Appropriate information systems in underdeveloped countries: The case of the Sudan.** Wesley, C. (National Council for Research, Khartoum (Sudan). National Documentation Centre); Weyers, R. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 12p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628899. Source: OSTI; NTIS (US Sales Only); INIS.

Considers the application of new technology to information systems in underdeveloped countries taking the case of the National Documentation Centre (NDC) in Khartoum, Sudan as an example. Describes the implementation of a project there to improve information collection and dissemination using microcomputers and micrographics. The scope of the project is to collect conventional and non-conventional documents produced in and about Sudan in the areas of science, technology and the social sciences, and to maintain databases containing bibliographic, research project, institutional and personnel data. Examines the advantages of microcomputers for underdeveloped countries and other technological developments such as CD-ROM, desktop publishing, expert systems and factors such as exchange of data, repackaging of information, and cooperation, all of which are likely to have an impact on scientific and technological information provision in the 1990s. Considers constraints to introducing new technology (hardware/software procurement and maintenance, operating conditions, existing document delivery systems, absence of information sharing culture) but argues that a longer term development strategy which allows for training, long term funding, cooperation and appropriate computer applications will result in sustainable information systems development in underdeveloped countries. (author). 11 refs.

17300 (IAEA-SM–317/41) **National scholarly information system in Japan. Extended synopsis.** Adachi, J. (National Center for Science Information System (NACSIS), Tokyo (Japan)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628900. Source: OSTI; NTIS (US Sales Only); INIS.

A recent development of academic information network serving university community in Japan is reported. Quantitative aspects of academic activities in the sector of library and information services are reviewed.

17301 (IAEA-SM–317/42) **Hyperdatabase: A schema for browsing multiple databases.** Shepherd, M.A. (Dalhousie Univ., Halifax (Canada). Computer Science Div.); Watters, C.R. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 24p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628901. Source: OSTI; NTIS (US Sales Only); INIS.

In order to insure effective information retrieval, a user may need to search multiple databases on multiple systems. Although front end systems have been developed to assist the user in accessing different systems, they access one retrieval system at a time and the search has to be repeated for each required database on each retrieval system. More importantly, the user interacts with the results as independent sessions. This paper models multiple bibliographic databases distributed over one or more retrieval systems as a hyperdatabase, i.e., a single virtual database. The hyperdatabase is viewed as a hypergraph in which each node represents a bibliographic item and the links among nodes represent relations among the items. In the response to a query, bibliographic items are extracted from the hyperdatabase and linked together to form a transient hypergraph. This hypergraph is transient in the sense that it is "created" in response to a query and only "exists" for the duration of the query session. A hypertext interface permits the user to browse the transient hypergraph in a nonlinear manner. The technology to implement a system based on this model is available now, consisting of powerful workstation, distributed processing, high-speed communications, and CD-ROMs. As the technology advances and costs decrease such systems should be generally available. (author). 13 refs, 5 figs.

17302 (IAEA-SM–317/59) **Evaluation of networking and telecommunication; some experiences gained.** Podshibyakin, V. (United Nations Industrial Development Organization (UNIDO), Vienna (Austria)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 1p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628902. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. UNIDO/information systems; COMPUTER NETWORKS; DEVELOPING COUNTRIES; INFORMATION DISSEMINATION; UNIDO

17303 (IAEA-SM–317/60) **Biotechnology information service of the GDR.** Poetzsch, E. (Academy of Sciences, Berlin (Germany). Scientific Information Center). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 13p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628903. Source: OSTI; NTIS (US Sales Only); INIS.

The paper gives a survey of the biotechnology information in the GDR and describes the establishment of the Biotechnology Information Service of the GDR (BioInfo GDR). BioInfo GDR is a referral database and is to provide information on information sources available in the GDR, and on institutions working in the various fields of biotechnology in the GDR. In addition, some general problems of the building and use of databases are discussed. (author). 8 refs.

17304 (IAEA-SM–317/62) **Information support for solving research and development problems.** Kornhauser, A. (Ljubljana Univ., Ljubljana (Yugoslavia). International Centre for Chemical Studies). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628904. Source: OSTI; NTIS (US Sales Only); INIS.

The approaches in developing specialized problem-oriented information systems for solving research and industrial problems are presented.

17305 (IAEA-SM–317/66) **The future of scientific, technical and industrial information to Third World users - A donors view. The experience of the International Development Research Centre (IDRC), Canada.** Broadbent, K.P. (International Development Research Centre, Ottawa (Canada). Science and Technology Information); Lafond, R. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 13p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628905. Source: OSTI; NTIS (US Sales Only); INIS.

Access to scientific information by poorer countries, sometimes referred to as the "South", is limited in contrast to the countries in the "North". The South lacks the infrastructure, management and technical expertise to develop and support the range of services now commonplace in the information rich industrial countries of the "North". The programme of support to information systems and services in poorer countries by the International Development Research Centre (IDRC) is described with specific examples drawn from its industry and technology information programme. Third world countries are in a difficult position and need help to keep on the cutting edge of new information-communication technologies. Any help, however must focus on such factors as persistence, impact and sustainability of information systems and services. (author). 5 refs.

17306 (IAEA-SM–317/70) **Needs, demands and motivation in the use of sources of information.** Lancaster, F.W. (Illinois Univ., Urbana, IL (United States). Graduate School of Library and Information Science). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 22p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628906. Source: OSTI; NTIS (US Sales Only); INIS.

For designers and managers of information services it is important to have some understanding of the factors that influence the probability that an information need will arise in the mind of some individual, that this individual will be sufficiently motivated to seek the needed information, and that he or she will select a particular information source. While our knowledge of these matters is still very far from complete, the many hundreds of "user studies" that have been performed have at least shed some light on them. Factors affecting the selection of a particular information source (e.g., information center or library) will include some user factors (e.g., previous experience with a source) and many source-related factors, including currency, cost, accessibility, reputation, dissemination and marketing efforts, and the format and content of the information available. Accessibility will be a major factor influencing use of an information source but this goes far beyond physical accessibility; intellectual and psychological accessibility must also be considered. This paper combines these various factors into a "model" of information-seeking behaviour and from this attempts to draw conclusions that may be useful in the design of future information services. 61 refs, 1 fig.

17307 (IAEA-SM–317/71) **Integration of library and information activities: The INIST challenge.** Dusoulier, N. (Institut de l'Information Scientifique et Technique (INIST-CNRS), Vandoeuvre-les-Nancy Cedex (France)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628907. Source: OSTI; NTIS (US Sales Only); INIS.

A presentation of the INIST (Institut de l'Information Scientifique et Technique) of CNRS (France) as a complete information factory which combines all the activities involved in managing an important collection and a large-scale document delivery center with the production and operation of databases, online services, publication of current bibliographies and reference tools, production of CD-ROMs, and research activities in the field of information science and technology, is given.

17308 (IAEA-SM–317/75) **Strategic information for industrial policy-making in developing countries.** Gonod, P.F. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 23p. (In French). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628908. Source: OSTI; NTIS (US Sales Only); INIS.

The practice shows that many crucial decisions for industrialization in developing countries have been taken based on incomplete information. For strategic decisions an incomplete information may have catastrophic consequences. The function of policy-making is defined as the process by which the information generated/or used in a particular context is reevaluated in a different context in order to formulate/or execute a policy of alternative decisions. It follows that the industrial information must be presented in such a manner to allow a reevaluation and alternative decisions. 30 notes.

17309 (IC–94/234, pp. 5) **The beginnings of the first cell.** Mohan, R. (Max-Planck-Institut fuer Biophysikalische Chemie (Karl-Friedrich-Bonhoeffer-Institut), Goettingen (Germany)). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on*

the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference. 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/bacteria; ANIMAL CELLS; BIOGEOCHEMISTRY; BACTERIA; HISTORICAL ASPECTS

17310 (IC–94/234, pp. 7) **Alfonso L. Herrera: A Mexican pioneer in the study of chemical evolution.** Negron Mendoza, A. (Universidad National Autonoma de Mexico, Mexico City (Mexico). Inst. de Ciencias Nucleares). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 4 refs. BIOCHEMISTRY/historical aspects; BIOCHEMISTRY; BIOLOGICAL EVOLUTION

17311 (IC–94/234, pp. 15-18) **Structure and palaeobiology of the early cell: Evidences from India.** Tewari, V.C. (Wadia Inst. of Himalayan Geology, Dehra Dun (India)). International Centre for Theoretical Physics, Trieste (Italy); Commission of the European Communities, Brussels (Belgium); International Centre for Genetic Engineering and Biotechnology, Trieste (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); International Science Foundation. Aug 1994. (CONF-9408232–: Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference, Trieste (Italy), 29 Aug - 2 sep 1994). In *Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference.* 28p. Order Number DE95627538. Source: OSTI; NTIS (US Sales Only); INIS.

Recent biochemical and carbon isotopic evidences from the Indian lithosphere (Archaean-Proterozoic sediments of the Peninsular and Lesser-Himalayan basins) suggest that early Earth's atmosphere-ocean system was buffered by mantle. The structure and palaeobiology of the early cells revealed that uni to multicellularity of cells reflects varying rates of photosynthesis and the mechanism of cell division may be as a result of mitosis or meiosis, recorded in Deoban cells of the Lesser Himalaya, India.

17312 (INIS-mf–14483) **Proceedings of the 11. conference of Czech and Slovak physicists.** Kolnik, S. (ed.). Slovenskych Matematikov a Fyzikov, Bratislava (Slovakia). Fyzikalna Vedecka Sekcia; Jednota Ceskych Matematiku a Fyziku, Prague (Czech Republic). Fyzikalni Vedecka Sekce; Vysoka Skola Dopravy a Spojov, Zilina (Slovakia); Jednota Slovenskych Matematikov a Fyzikov, Zilina (Slovakia). 1994. 247p. (In Czech, Slovak, English). (CONF-9308262–: 11. conference of Czech and Slovak physicists, Zilina (Slovakia), 30 Aug - 3 sep 1993). Order Number DE95626244. Source: OSTI; NTIS (US Sales Only); INIS.

Out of 146 papers presented at the conference, the proceedings contain full texts of 10 papers and 17 short communications. All these contributions have been inputted to INIS. The topics covered by the conference are subnuclear physics, nuclear physics, plasma physics, detectors, physics of metals, low-temperature physics, physics of superconductors and dielectrics, optics and quantum electronics, magnetism, thin layers, chemical physics and biophysics, acoustics and physics of molecular and macromolecular systems. (Z.S.).

17313 (ORNL/M–4156) **The Environmental Management Project Manager's Handbook for improved project definition.** Oak Ridge National Lab., TN (United States). Feb 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009041. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy (DOE) is committed to providing high quality products that satisfy customer needs and are the associated with this goal, DOE personnel must possess the knowledge, skills, and abilities to ensure successful job performance. In addition, there must be recognition that the greatest obstacle to proper project performance is inadequate project definition. Without strong project definition, DOE environmental management efforts are vulnerable to fragmented solutions, duplication of effort, and wastes resources. The primary means of ensuring environmental management projects meet cost and schedule milestones is through a structured and graded approach to project definition, which is the focus of this handbook.

17314 (PNL-SA–24262) **Designing and implementing customer-focused functional support teams.** Levine, L.O.; Cejka, C.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950282–3: 3. international symposium on productivity and quality improvement conference, Vienna, VA (United States), 27 Feb - 1 mar 1995). Order Number DE95007814. Source: OSTI; NTIS; GPO Dep.

The contract services department of a U.S. Department of Energy research laboratory is radically revising how it serves its primary customers–the laboratory research and development staff. The department provides services that include contract research initiation (proposal preparation and contract negotiation) and acquisition of goods and services to support specific research projects. It previously provided these services with approximately 170 staff in four centralized functional units. In reorganizing, the department used a structured analysis and design process to categorize internal customers according to their unique attributes and specific support needs. Concurrently, it identified a number of conceptually distinct customer-focused units that could accomplish the contract processes in different ways and then chose a preferred concept for each customer category. The organizational concepts were designed to enhance customer service and improve staff morale and development opportunities. The new organization will have a total of 10 customer support units as well as other centralized services and activities. It will flatten the organizational structures and encourage more cooperation among contracts staff to meet customer needs for improved timeliness, communication, and teaming with researchers.

17315 (PNL-SA–25327) **A case study: Integrated work environment and organizational change.** Heubach. J.G. (Pacific Northwest Lab., Richland, WA (United States)); Montgomery, J.C.; Weimer, W.C.; Heerwagen, J.H. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950282–2: 3. international symposium on productivity and quality improvement conference, Vienna, VA (United States), 27 Feb - 1 mar 1995). Order Number DE95009119. Source: OSTI; NTIS; GPO Dep.

The failure to integrate environmental and organizational interventions may help explain the lack of success of many change efforts. The high rate of failure for change efforts (50% to 90% failure rates) has been noted by many writers. While specific causes of failure are diverse, a common theme has been failure to consider the organization as a system. That is, either significant aspects of the organization were ignored during the intervention or potential impacts of changes on the elements were overlooked or underestimated. Our own training, technical literature, and professional culture lead us to limited understandings of complex organizations. Change agents must consider all relevant components of organizational performance if interventions are to be meaningful and successful. This study demonstrated the value of an integrated organizational intervention involving redesign of the physical environment, introduction of a new information system, work process improvement, and extended organizational development intervention. The outcomes were extremely positive. The cost of improvement efforts was found to be recaptured within a short time, easily justifying the expenditures. One conclusion from the study is that integrated interventions are very powerful. Integrating improvement of the physical environment with organizational development and technological innovation greatly enhances the likelihood of achieving a successful intervention.

17316 (RERF-AR–91-92) **Annual report of Radiation Effects Research Foundation, April 1, 1991 - March 31, 1992.** Radiation Effects Research Foundation, Hiroshima (Japan). 1993. 165p. (In Japanese). Order Number DE95768250. Source: OSTI; NTIS; INIS.

This is an annual report concerning research activities and achievement in the Radiation Effects Research Foundation (RERF) in Japan during the period April 1, 1991-March 31, 1992. During this period, 25 publications were approved, including some epoch studies (such as the life span study that revealed a significant increase of cardiovascular disease of A-bomb survivors and the study on thyroid cancer). The present report deals with scientific achievement of each division of RERF; various activities including international cooperation programs, workshop, lectures, and in-house seminars; abstracts of new research topics, achievement reports, and review reports; a list of publications and presentations by staff members in academic meetings; and RERF organization affairs including activities, financial aspects, a list of visitors to RERF. An Appendix gives the proceedings; a brief summary of the workshop on 'the application of molecular genetics to the study of mutation in the children of A-bomb survivors' held in November 12-14, 1991; both ongoing and completed research topics as of March 31, 1992; and a list of RERF personnel. (N.K.).

17317 (RERF-AR–92-93) **Annual report of Radiation Effects Research Foundation, April 1, 1992 - March 31, 1993.** Radiation Effects Research Foundation, Hiroshima (Japan). 1994. 183p. (In Japanese). Order Number DE95768251. Source: OSTI; NTIS; INIS.

This is an annual report concerning research activities and achievement in the Radiation Effects Research Foundation (RERF) in Japan during the period April 1, 1992-March 31, 1993. Twenty-nine reports, including integrated report on the incidence of solid tumors (surveyed during the period 1958-1987) and the report on the incidence of leukemia (surveyed during the period 1950-1987), were approved in the fiscal year 1992. The present report deals with scientific achievement of each division of RERF; various activities including international cooperation programs, disease monitoring workshop, lectures, and in-house seminars; abstracts of new research topics, achievement reports, and review reports; a list of publications and presentations by staff members in academic meetings; and RERF organization affairs including activities, financial aspects, and a list of visitors to RERF. An Appendix gives the proceedings; a brief summary of disease monitoring workshop; ongoing and completed research topics; and a list of RERF personnel. (N.K.).

17318 (RISO-R–793(EN)) **Optics and fluid dynamics department annual progress report for 1994.** Hanson, S.G.; Lading, L.; Lynov, J.P.; Michelsen, P. Risoe National Lab., Roskilde (Denmark). Optics and Fluid Dynamics Dept. Jan 1995. 68p. Order Number DE95627114. Source: OSTI; NTIS; INIS.

Research in the Optics and Fluid Dynamics Department is performed within the following two programme areas: optics and continuum physics. In optics the activities are within (a) optical materials and electromagnetic propagation, (b) diagnostics and sensors, and (c) information processing. In continuum physics the activities are (a) nonlinear dynamics and (b) computer physics. The activities are supported by several EU programmes, including EURATOM, by research councils, and by industry. A special activity is the implementation of pellet injectors for fusion research. A summary of activities in 1994 is presented. (au) (27 ills., 44 refs.).

17319 (RISO-R–807(EN)) **Nuclear Safety Research Department annual progress report 1994.** Majborn, B.; Brodersen, K.; Damkjaer, A.; Hoejerup, C.F. (eds.). Risoe National Lab., Roskilde (Denmark). Nuclear Safety Research Dept. Mar 1995. 36p. Order Number DE95628910. Source: OSTI; NTIS; INIS.

The report describes the work of the Nuclear Safety Research Department during 1994. The activities cover health physics, reactor physics, operation of the small reactor DR1, and radioactive waste management. Lists of staff and publications are included together with a summary of the staff's participation in international committees. (au) (1 tab., 12 ills.).

17320 (UTRCN-G–23) **Report on progress of researches by common utilization of JAERI nuclear facilities, for fiscal 1993.** Tokyo Univ. (Japan). Research Center for Nuclear Science and Technology. Jul 1994. 378p. (In Japanese, English). Order Number DE95768241. Source: OSTI; NTIS; INIS.

The results of the joint researches by utilizing the facilities of JAERI in 1993 fiscal year were summarized. The number of research themes in 1993 was 228 cases. In this book, 243 reports are collected. (J.P.N.).

17321 (WHC-SD-GN-UM–30008-Rev.1) **Westinghouse Hanford Company Data Management Plan Template. Revision 1.** Friday, K.K. Westinghouse Hanford Co., Richland, WA (United States). 1 Mar 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010046. Source: OSTI; NTIS; INIS; GPO Dep.

The Data Management Plan Template provides guidelines for the content and writing of data management plans. These plans discuss how data management is being implemented within the scope of any given project, program, or business function. (The entire document was revised and changed to reflect a simplified outline and clarification of required information.)

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Refer also to citation(s) 14799, 14912, 14971, 15000, 15012, 15035, 15037, 15038, 15063, 15148, 15210, 15314, 15393, 15396, 15397, 15398, 15399, 15464, 15477, 15572, 15573, 15574, 15575, 15576, 15577, 15578, 15579, 15592, 15608, 15625, 15653, 15688, 15705, 15796, 15889, 16255, 16260, 16262, 16263, 16274, 16277, 16292, 16293, 16294, 16329, 16357, 16416, 16464, 16470, 16471, 16515, 16516, 16562, 16613, 16637, 16660, 16700, 16755, 16922, 16923, 16925, 16937, 17186, 17408, 17409, 17440

17322 (BNL–52458) **Introduction to computers: Reference guide.** Ligon, F.V. Brookhaven National Lab., Upton, NY (United States). [1995]. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95009412. Source: OSTI; NTIS; GPO Dep.

The "Introduction to Computers" program establishes formal partnerships with local school districts and community-based organizations, introduces computer literacy to precollege students and their parents, and encourages students to pursue Scientific, Mathematical, Engineering, and Technical careers (SET). Hands-on assignments are given in each class, reinforcing the lesson taught. In addition, the program is designed to broaden the knowledge base of teachers in scientific/technical concepts, and Brookhaven National Laboratory continues to act as a liaison, offering educational outreach to diverse community organizations and groups. This manual contains the teacher's lesson plans and the student documentation to this introduction to computer course.

17323 (CERN–94-06) **1993 CERN school of computing. Proceedings.** Vandoni, C.E. (ed.); Verkerk, C. (ed.). European Organization for Nuclear Research, Geneva (Switzerland). 14 Oct 1994. 304p. (CONF-9309478–: 16. CERN School of Computing, L'Aquila (Italy), 12-25 Sep 1993). Order Number DE95627098. Source: OSTI; NTIS (US Sales Only); INIS.

These proceedings contain the majority of the lectures given at the 1993 CERN School of Computing. Artificial neural networks were treated with particular emphasis on applications in particle physics. A discussion of triggering for experiments at the proposed LHC machine provided a direct connection to data acquisition in this field, whereas another aspect of signal processing was seen in the description of a gravitational wave interferometer. Some of the more general aspects of data handling covered included parallel processing, te IEEE mass storage system, and the use of object stores of events. Lectures on broadband telecommunications networks and asynchronous transfer mode described some recent developments in communications. The analysis and visualization of the data were discussed in the talks on general-purpose portable software tools (PAW++, KUIP and PIAF) and on the uses of computer animation and virtual reality to this end. Lectures on open software discussed operating systems and distributed computing, and the evolution of products like Unix, NT and DCE. (orig.) e.

17324 (CONF-9406279–Absts.) **Fifth international conference on hyperbolic problems – theory, numerics, applications: Abstracts.** State Univ. of New York, Stony Brook, NY (United

States). Dept. of Applied Mathematics and Statistics. [1994]. 111p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG02-94ER25195. From 5. international conference on hyperbolic problems; Stony Brook, NY (United States); Jun 1994. Order Number DE95008173. Source: OSTI; NTIS; INIS; GPO Dep.

The conference demonstrated that hyperbolic problems and conservation laws play an important role in many areas including industrial applications and the studying of elasto-plastic materials. Among the various topics covered in the conference, the authors mention: the big bang theory, general relativity, critical phenomena, deformation and fracture of solids, shock wave interactions, numerical simulation in three dimensions, the level set method, multidimensional Riemann problem, application of the front tracking in petroleum reservoir simulations, global solution of the Navier-Stokes equations in high dimensions, recent progress in granular flow, and the study of elastic plastic materials. The authors believe that the new ideas, tools, methods, problems, theoretical results, numerical solutions and computational algorithms presented or discussed at the conference will benefit the participants in their current and future research.

17325 (CONF-950181–1) **Use of the NII to study impacts of new technologies and policies on supply and demand of electric power.** Munro, J.K. Jr. (Oak Ridge National Lab., TN (United States). Instrumentation and Controls Div.). Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Information and telecommunications technology for the U.S. utilities industry; Atlanta, GA (United States); 30-31 Jan 1995. Order Number DE95009075. Source: OSTI; NTIS; GPO Dep.

This paper describes a proposal to use an implementation of client-server technology on the Internet for simulating a number of aspects of electric power production, distribution, and consumption within a wholly new regulatory, financing, operating, and control environment. This approach would use a large number of people to generate strategies and decisions, in a real-time context, needed to drive the simulation. A World Wide Web server would provide background information about the simulation for those who chose to participate as actors in one of supported roles. Roles would be based on activities associated with different business areas and would include utility manager, independent power producer (entrepreneur), electric power futures trader, electric power futures investor, electric power wheeler, industrial customer, commercial customer, and residential customer. The simulation program would run on a system of high-performance computers (parallel computer system) that communicate between each other on a high speed communications bus. These computers would also be the server systems for the client programs used by the actors. People who want to be actors would be required to register before being given a client program, as a way to have some control over the simulation results. Each role will have its corresponding client program with graphical user interface. Each client program will support a common view of the simulation results and a role specific view.

17326 (CONF-950226–33) **An evaluation of an automatic markup system.** Taghva, K.; Condit, A.; Borsack, J. Nevada Univ., Las Vegas, NV (United States). Information Science Research Inst. [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. From SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995. Order Number DE95009885. Source: OSTI; NTIS; GPO Dep.

One predominant application of OCR is the recognition of full text documents for information retrieval. Modern retrieval systems exploit both the textual content of the document as well as its structure. The relationship between textual content and character accuracy have been the focus of recent studies. It has been shown that due to the redundancies in text, average precision and recall is not heavily affected by OCR character errors. What is not fully known is to what extent OCR devices can provide reliable information that can be used to capture the structure of the document. In this paper, the authors present a preliminary report on the design and evaluation of a system to automatically markup technical documents, based on information provided by an OCR device. The device the authors use differs from traditional OCR devices in that it not only performs optical character recognition, but also provides detailed information about page layout, word geometry, and font usage. Their automatic markup program, which they call Autotag, uses this information, combined with dictionary, lookup and content analysis, to identify structural components of the text. These include the document title, author information, abstract, sections, section titles, paragraphs, sentences, and de-hyphenated words. A visual examination of the hardcopy will be compared to the output of their markup system to determine its correctness.

17327 (CONF-950226–34) **Prediction of OCR accuracy using simple image features.** Blando, L.R.; Kanai, Junichi; Nartker, T.A. Nevada Univ., Las Vegas, NV (United States). Information Science Research Inst. [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. From SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995. Order Number DE95009887. Source: OSTI; NTIS; GPO Dep.

A classifier for predicting the character accuracy of a given page achieved by any Optical Character Recognition (OCR) system is presented. This classifier is based on measuring the amount of white speckle, the amount of character fragments, and overall size information in the page. No output from the OCR system is used. The given page is classified as either good quality (i.e., high OCR accuracy expected) or poor (i.e., low OCR accuracy expected). Six OCR systems processed two different sets of test data: a set of 439 pages obtained from technical and scientific documents and a set of 200 pages obtained from magazines. For every system, approximately 85% of the pages in each data set were correctly predicted. The performance of this classifier is also compared with the ideal-case performance of a prediction method based upon the number of reject markers in OCR generated text. In several cases, this method matched or exceeded the performance of the reject based approach.

17328 (CONF-950226–35) **A preliminary evaluation of histogram-based binarization algorithms.** Kanai, Junichi; Grover, K. Nevada Univ., Las Vegas, NV (United States). Heat Transfer Lab. [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. From SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995. Order Number DE95009886. Source: OSTI; NTIS; GPO Dep.

To date, most Optical Character Recognition (OCR) systems process binary document images, and the quality of the input image strongly affects their performance. Since a binarization process is inherently lossy, different algorithms typically produce different binary images from the same gray scale image. The objective of this research is to study effects of global binarization algorithms on the performance of OCR systems. Several binarization methods were examined: the best fixed threshold value for the data set, the ideal histogram method, and Otsu's algorithm. Four contemporary OCR systems and 50 hard copy pages containing 91,649 characters were used in the experiments. These pages were digitized at 300 dpi and 8 bits/pixel, and 36 different threshold values (ranging from 59 to 199 in increments of) 4 were used. The resulting 1,800 binary images were processed by all four OCR systems. All systems made approximately 40% more errors from images generated by Otsu's method than those of the ideal histogram method. Two of the systems made approximately the same number of errors from images generated by the best fixed threshold value and Otsu's method.

17329 (CONF-9505145–2) **Finite-sample based learning algorithms for feedforward networks.** Rao, N.S.V. (Oak Ridge National Lab., TN (United States)); Protopopescu, V.; Mann, R.C.; Oblow, E.M.; Iyengar, S.S. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Symposium on theory of computing; Las Vegas, NV (United States); 29

May - 1 jun 1995. Order Number DE95009123. Source: OSTI; NTIS; GPO Dep.

We discuss two classes of convergent algorithms for learning continuous functions (and also regression functions) that are represented by FeedForward Networks (FFN). The first class of algorithms, applicable to networks with unknown weights located only in the output layer, is obtained by utilizing the potential function methods of Aizerman et al. The second class, applicable to general feedforward networks, is obtained by utilizing the classical Robbins-Monro style stochastic approximation methods. Conditions relating the sample sizes to the error bounds are derived for both classes of algorithms using martingale-type inequalities. For concreteness, the discussion is presented in terms of neural networks, but the results are applicable to general feedforward networks, in particular to wavelet networks. The algorithms can also be directly applied to concept learning problems. A main distinguishing feature of the this work is that the sample sizes are based on explicit algorithms rather than information-based methods.

17330 (ENEA-RT-AMB–95-02) **About Unix.** Caiaffa, E. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute). ENEA, Casaccia (Italy). Area Energia Ambiente e Salute. Jan 1995. 25p. (In Italian). (RT/AMB–95-02). Order Number DE95771030. Source: OSTI; NTIS (US Sales Only).

The aim of the present study is to investigate the main technical and historical reasons that led to Unix system birth, evolution and diffusion. Nowadays Unix is a phenomenon involving various aspects such as technology, market trends and industrial politics. Unix operating system has widely contributed to the bases and growth of open system. This paper reviews ideas behind the concept of open system and its evolution together with instruments which allowed its practical development. Also care has been taken to clarify the meaning and scopes associations, organizations and committees such as X/Open, OSF (Open Software Foundation), SCO (Santa Cruz Operation), ACE (Advanced Computing Environment) and others.

17331 (ES/ER/TM–146) **Geostatistical applications in environmental remediation.** Stewart, R.N. (Univ. of Tennessee, Knoxville, TN (United States)); Purucker, S.T.; Lyon, B.F. Oak Ridge National Lab., TN (United States). Feb 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95009998. Source: OSTI; NTIS; GPO Dep.

Geostatistical analysis refers to a collection of statistical methods for addressing data that vary in space. By incorporating spatial information into the analysis, geostatistics has advantages over traditional statistical analysis for problems with a spatial context. Geostatistics has a history of success in earth science applications, and its popularity is increasing in other areas, including environmental remediation. Due to recent advances in computer technology, geostatistical algorithms can be executed at a speed comparable to many standard statistical software packages. When used responsibly, geostatistics is a systematic and defensible tool can be used in various decision frameworks, such as the Data Quality Objectives (DQO) process. At every point in the site, geostatistics can estimate both the concentration level and the probability or risk of exceeding a given value. Using these probability maps can assist in identifying clean-up zones. Given any decision threshold and an acceptable level of risk, the probability maps identify those areas that are estimated to be above or below the acceptable risk. Those areas that are above the threshold are of the most concern with regard to remediation. In addition to estimating clean-up zones, geostatistics can assist in designing cost-effective secondary sampling schemes. Those areas of the probability map with high levels of estimated uncertainty are areas where more secondary sampling should occur. In addition, geostatistics has the ability to incorporate soft data directly into the analysis. These data include historical records, a highly correlated secondary contaminant, or expert judgment. The role of geostatistics in environmental remediation is a tool that in conjunction with other methods can provide a common forum for building consensus.

17332 (ESTSC–000158D0VAX03) **DOE2.1E. Building Energy Consumption Analysis.** Birdsall, B. (Lawrence Berkeley National Lab., CA (United States)); Buhl, W.; Ellington, K.; Erdem, E.; Meldem, R; Winkelmann, F.; Hirsch, J.J.; Gates, S. Lawrence Berkeley Lab., CA (United States). 1 Oct 1993. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Source: ESTSC.

Description: DEC VAX; VMS; FORTRAN; 1 Mag Tape (VAX/VMS Backup Format). File naming conventions: .SRC UPDATE source file, .UPL UPDATE program library, .MOD UPDATE modification file, .FOR FORTRAN source code, .OBJ object file (output of compiler), .EXE executable file (output of linker), .TMP temporary file, .BIN binary file, .DAT ASCII data file, .INP input file, .INC include file for macro input, and .OUT output file.

DOE2.1E is a set of programs for the analysis of energy consumption in residental and commercial buildings. Programs are included to enter input data (Building Description Language Processor), to calculate the heating and cooling loads for each space in a building for each hour of a year (LOADS subprogram), to simulate the operation and response of the equipment and systems that control temperature and humidity and distribute heating and cooling to the building (SYSTEMS subprogram), to model primary energy conversion equipment that uses fuel or electricity to provide the required heating, cooling, and electricity (PLANT subprogram), to compute the cost of energy and building operation based on utility rate schedules and economic parameters (ECONOMICS subprogram), to display results (Reports subprogram), and to convert raw weather files into DOE-2 compatible weather files (Weather Processor). A library of materials, constructions, and windows is provided.

17333 (ESTSC–000158SUN0001) **DOE2.1E. Building Energy Consumption Analysis.** Birdsall, B. (Lawrence Berkeley National Lab., CA (United States)); Buhl, W.; Ellington, K.; Erdem, E.; Meldem, R.; Winkelmann, F.; Hirsch, J.; Gates, S. Lawrence Berkeley Lab., CA (United States). 1 Oct 1993. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Source: ESTSC.

Description: SUN; UNIX; FORTRAN; 1 QIC 150/250 Cartridge. File naming conventions: .SRC UPDATE source file, .UPL UPDATE program library, .MOD UPDATE modification file, .FOR FORTRAN source code, .OBJ object file (output of compiler), .EXE executable file (output of linker), .TMP temporary file, .BIN binary file, .DAT ASCII data file,. INP input file, .INC include file for macro input, .OUT output file.

DOE2.1E is a set of programs for the analysis of energy consumption and cost in residential and commercial buildings. Programs are included to enter input data (Building Description Language Processor), to calculate the heating and cooling loads for each space in a building for each hour of a year (LOADS subprogram), to simulate the operation and response of the equipment and systems that control temperature and humidity and distribute heating and cooling to the building (SYSTEMS subprogram), to model primary energy conversion equipment that uses fuel or electricity to provide the required heating, cooling, and electricity (PLANT subprogram), and to compute the cost of energy and building operation based on utility rate schedules and economic parameters (ECONOMICS subprogram), to display results (Reports subprogram)), and to convert raw weather files into DOE-2 compatible weather files (Weather Processor). A library of materials, constructions, and windows is provided.

17334 (ESTSC–000175IBMPC02) **INTERLINE5.0. Railroad Routing Model.** Johnson, Paul E. (Oak Ridge National Lab., TN, (United States)); Joy, David S. Oak Ridge National Lab., TN (United States). 1 Mar 1993. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Source: ESTSC.

Description: IBM PC; DOS 3.1 or greater.; FORTRAN 77; 1 3.5 Diskette. INTERLINE expects data files to conform to its standard names. Program uses calls to MICROSOFT FORTRAN extensions.

INTERLINE/PC is an interactive program designed to simulate the routing practices of the United States rail system. The rail industry is divided into a large number of independent competing companies. The INTERLINE data base represents these rail companies as 94 separate subnetworks. An additional two subnetworks represent navigable inland/intracoastal and deep draft marine

routes. Interchange points between individual rail systems and waterway systems are also identified.

17335 (ESTSC–000702D0VAX00) **NUMBERDENSITY. Provides Core/Region Atomic Densities for Physics Codes.** Shirley, G. (CEGA Corporation, San Diego, CA (United States)). General Atomics, San Diego, CA (United States). 13 Mar 1993. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-90CH10438. Source: ESTSC.

Description: DEC VAX; VMS; FORTRAN; 1 Mag Tape. Many input quantities are currently hardwired for the NP-MHTGR design. Package compiled and linked without error.

NUMBERDENSITY provides core/region atomic densities, Dancoff factors, particle packing fractions for various physics codes, including MICROX, GARGOYLE, and GAUGE.

17336 (ESTSC–000723IB38600) **FLUFIXMOD2. Two-fluid Hydrodynamic Model for Fluid-Flow Simulation in Fluid-Solids Systems.** Lyczkowski, R.W. (Argonne National Lab., IL (United States)); Bouillard, J.X.; Folga, S.M. Aerolab Development Co., Pasadena, CA (United States). 1 Apr 1992. Sponsored by USDOE, Washington, DC (United States). Source: ESTSC.

Description: IBM PC 386; Designed to be portable; FORTRAN 77; 1 3.5 Diskette.

FLUFIX is a two-dimensional , transient, Eulerian, and finite-difference program, based on a two-fluid hydrodynamic model, for fluid flow simulation in fluid-solids systems. The software is written in a modular form using the Implicit Multi-Field (IMF) numerical technique. Quantities computed are the spatial distribution of solids loading, gas and solids velocities, pressure, and temperatures. Predicted are bubble formation, bed frequencies, and solids recirculation. Applications include bubbling and circulating atmospheric and pressurized fluidized bed reactors, combustors, gasifiers, and FCC (Fluid Catalytic Cracker) reactors.

17337 (ESTSC–000749IBMPC00) **KINETICSV3.2. A Computer Program to Analyze Chemical Reaction Rate Data.** Braun, R.L. (Lawrence Livermore National Laboratory, Livermore, CA (United States)); Burnham, A.K. Lawrence Livermore National Lab., CA (United States). 1 Sep 1994. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Source: ESTSC.

Description: IBM PC; MS-DOS; Fortran; 4 3.5 Diskettes.

KINETICS (Version 3.2) is a copyrighted, user-friendly kinetics analysis computer program designed for reactions such as kerogen or polymer pyrolysis. It uses least-squares refinement to fit rate parameters to chemical reaction data (rate or cumulative reacted) measured at a series of constant temperatures, constant heating rates, or arbitrary thermal histories.

17338 (ESTSC–000749SPARC00) **KINETICSV3.2. A Computer Program to Analyze Chemical Reaction Rate Data.** Braun, R.L. (Lawrence Livermore National Laboratory, Livermore, CA (United States)); Burnham, A.K. Lawrence Livermore National Lab., CA (United States). 1 Sep 1994. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Source: ESTSC.

Description: SUN SPARC; UNIX; Fortran; 5 3.5 Diskettes.

KINETICS (Version 3.2) is a copyrighted, user-friendly kinetics analysis computer program designed for reactions such as kerogen or polymer pyrolysis. It uses least-squares refinement to fit rate parameters to chemical reaction data (rate or cumulative reacted) measured at a series of constant temperatures, constant heating rates, or arbitrary thermal histories.

17339 (ESTSC–000766AL00000) **TEAM. Technology Evaluation and Analysis Methodology Systems Analysis.** Bingham, T.A. (Lockheed Idaho Technologies Company, Idaho Falls, ID (United States)); Caldwell, M.A.; Nichols, T.T.; Pincock, L.F.; Reiser, S.I. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1 Oct 1994. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Source: ESTSC.

Description: APPLE MACINTOSH; Apple System 7 or higher; Prograph CPX; 1 3.5 Diskette.

TEAM provides a computer simulation/systems model for evaluation of process technology options to process nuclear waste at the Idaho Chemical Processing Plant. The model uses a life-cycle approach to evaluate costs for user specified options, as well as time phasing effects to cost, waste volumes, time to completion of processing, and other variables.

17340 (ESTSC/NRC–000004IBMPC02) **RASCAL2.1. Radiological Dose Assessment System.** Sjoreen, A.L. (Oak Ridge National Lab., TN (United States)); Athey, G.F.; Ramsdell, J.V.; McKenna, T.J. Oak Ridge National Lab., TN (United States). 1 Dec 1994. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Office for Analysis and Evaluation of Operational Data. Source: ESTSC; Source Code Not Included.

Description: IBM PC; MS-DOS 3.1 or later, 6.0 recommeMicrosoft Fortran 5.0 (60%) and Microsoft C 7.0 (40%); 1 3.5 Diskette. SOURCE CODE NOT INCLUDED.

RASCAL was developed to estimate doses during response to radiological emergencies. Revisions to RASCAL 2.0 have required the release of version 2.1. Three new source term calculations have been added: (1) a source term based on the reactor containment monitor reading, (2) a source term for a spent fuel pool accident, and (3) an isotopic concentration source term. The tabular output has been modified to include Environmental Protection Agency (EPA) Protective Action Guidance (PAGS). FM-DOSE calculations have been extended to include consideration of the effect of delay for re-entry on first-year and second-year dose, to incorporate a variable resupension rate, and to compute a factor used to estimate first-year dose from R/hr measurements on the ground. Also, RASCAL 2.1 supports the saving of cases and the use of a mouse for user input.

17341 (ESTSC/NRC–000005IBMPC01) **IMPACTS-BRC 2.1. Analyses of Potential Radiological Impacts.** Rao, R.R. (Sandia National Labs., Albuquerque, NM (United States)); Kozak, M.W.; Harlan, C.P.; Austin, V.; Rollstin, J.A. Sandia National Labs., Albuquerque, NM (United States). 1 Jul 1990. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Material Safety and Safeguards. Source: ESTSC.

Description: IBM PC; DOS 2.1 or higher, however will FORTRAN 77; 1 3.5 Diskette. Because IMPACTS-BRC 2.1 is a compliance code, the source code is not included with the package.

IMPACTS-BRC2.1 is a generic radiological assessment code that allows calculation of potential impacts to maximum individuals, waste disposal workers, and the general population resulting from exemption of very low-level radioactive wastes from regulatory control. The code allows calculations to be made of human exposure to the waste by many pathways and exposure scenarios.

17342 (ESTSC/NRC–000007D113400) **PSDREC. Continuous On-line Reactor Monitor.** Smith, C.M. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). 13 Jan 1992. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research. DOE Contract AC05-84OR21400. (NESC–1107). Source: ESTSC.

Description: DEC PDP11/34; RT-11 V4.0; FORTRAN IV (85%) and MACRO (15%); 1 Mag Tape.

PSDREC is a statistically-based pattern recognition system developed for continuous, on-line, unattended surveillance of dynamic reactor signals. The system provides a detailed record of the power spectral density values (PSDs) of the signals and their statistical characteristics. PSD measurements on process signals are the performance signatures that characterize the health of the monitored equipment. PSDREC can monitor 16 signals, use 15 signals in determining the operational state of the reactor, and store traceable historical data on suspect conditions. The PSDREC surveillance system uses four types of power spectral densities. These are formed over time spans. PSDZ is the short-term trend spectrum used to detect rapidly occurring signals. Each of the other three spectra is formed by ensemble averaging different numbers of PSDZ spectra. PSDB, the baseline spectrum, is formed over the longest time span. It is formed only once for each operational state. PSDT and PSDC are the long-term reference and candidate trend spectra which are formed over a relatively long time span and are used to reflect slow changes in the signal.

17343 (ETDE-IT–95-14) **Geometrical approach to direct solution of linear algebraic systems on Quadrics parallel computers.** Ricci, A. (ENEA, Bologna (Italy). Progetto Interdipartimentale Calcolo e Reti ad alte Prestazioni (HPCN)). ENEA, Bologna (Italy). Centro Ricerche Energia 'E. Clementel' - Area Energia e Innovazione. Sep 1994. 10p. Order Number DE95771053. Source: OSTI; NTIS (US Sales Only).

Direct methods for the solution of linear algebraic systems are described which require neither pivoting nor any integer variable, thus lending themselves to a convenient use on Quadrics parallel computers. As to computing speed they fairly compare with the commonly used direct methods.

17344 (FEI–2344) **Modern programming system for numerical simulation of thermohydraulics and thermomechanics processes.** Korolev, V.N.; Sorokin, A.P.; Ukhov, V.A. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1993. 14p. (In Russian). Order Number DE95628885. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the first step of the elaboration of a modern computer code for structural analysis and hydrodynamic processes of primary coolant circuit are presented in this work. The conceptual scheme of a program and specifications for the key components have been proposed. 79 refs., 1 fig.

17345 (IFVE-OEA–93-136) **EUR6500 auxiliary controllers for data readout, filtering and buffering.** Matveev, M.Yu. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 13p. (In Russian). Order Number DE95628812. Source: OSTI; NTIS (US Sales Only); INIS.

Four types of CAMAC/SUMMA EUR6500 auxiliary controllers and T-312 CAMAC testing module are described. 10 refs., 5 figs.

17346 (IFVE-OEIUNK/OEA–93-118) **Fastbus multifunctional interface module.** Kipiani, K.K. (AN Gruzinskoj SSR, Tbilisi (Georgia). Inst. Fiziki); Koshtoev, V.V.; Matveev, M.Yu. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 11p. (In Russian). Order Number DE95628814. Source: OSTI; NTIS (US Sales Only); INIS.

Fastbus multifunctional interface module for Fastbus Crate Segment, MISS readout and trigger electronic system and two SCSI busses interconnection is described. 8 refs., 3 figs., 1 tab.

17347 (IHEP–93-130) **Improved numerical algorithm for Newton's minimization of χ^2 functionals.** Alekhin, S.I. Institut Fiziki Vysokikh Ehnergij, Protvino (Russian Federation). 1993. 11p. Order Number DE95628886. Source: OSTI; NTIS (US Sales Only); INIS.

Numerical stability of Newton's algorithm applied to minimization of χ^2 functionals is considered. It is shown that the increase of experimental data precision leads to growth of numerical instability of this algorithm as well as of its modifications. As one of possible ways to suppress these instabilities 'semi-analytical' algorithm of χ^2 derivatives calculation is investigated. It is shown that application of the algorithm can save at least one order of magnitude of the required calculation precision of theoretical expectation in Z-boson line shape fitting. 3 refs., 3 figs., 1 tab.

17348 (INEL–94/0074) **Constrained noninformative priors.** Atwood, C.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1994. 16p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-94ID13223. Source: OSTI; NTIS; INIS.

The Jeffreys noninformative prior distribution for a single unknown parameter is the distribution corresponding to a uniform distribution in the transformed model where the unknown parameter is approximately a location parameter. To obtain a prior distribution with a specified mean but with diffusion reflecting great uncertainty, a natural generalization of the noninformative prior is the distribution corresponding to the constrained maximum entropy distribution in the transformed model. Examples are given.

17349 (INEL–94/0121) **Data management system: User's guide.** Idaho National Engineering Lab., Idaho Falls, ID (United States). 15 Nov 1994. 29p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95008692. Source: OSTI; NTIS; GPO Dep.

Data Management System (DMS) is a menu-driven, user-friendly system that allows you to manipulate software and data files as follows: Download files and software from the network to your personal computer; Compress files into a single archive file; Decompress files from an archive file; Remove files from your PC; Copy files from the source directory to the destination directory; and Configure DMS for your specific PC and network configuration. This user's guide provides instructions for operating the system and setup configuration.

17350 (INIS-mf–14519) **Quantitative schemes in energy dispersive X-ray fluorescence implemented in AXIL.** Tchantchane, A. (Centre de Developpement des Techniques Nucleaires, Algiers (Algeria)); Benamar, M.A.; Tobbeche, S. No corporate text available. Jan 1995. 9p. Order Number DE95628148. Source: OSTI; NTIS (US Sales Only); INIS.

E.D.X.R.F (Energy Dispersive X-ray Fluorescence) has long been used for quantitative analysis of many types of samples including environment samples. the software package AXIL (Analysis of x-ray spectra by iterative least quares) is extensively used for the spectra analysis and the quantification of x-ray spectra. It includes several methods of quantitative schemes for evaluating element concentrations. We present the general theory behind each scheme implemented into the software package. The spectra of the performance of each of these quantitative schemes. We have also investigated their performance relative to the uncertainties in the experimental parameters and sample description.

17351 (INIS-mf–14529, pp. 51) **NPROD-a program for calculation of neutron yields and spectra on a PC.** Tagesen, S.; Vonach, H. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PROGRAMMING/neutron emission; PROGRAMMING/neutron spectra; ALPHA PARTICLES; ALPHA REACTIONS; COMPUTER CALCULATIONS; EXPERIMENTAL DATA; ISOTOPES; MICROCOMPUTERS; PROGRAMMING; SPONTANEOUS FISSION

17352 (INIS-mf–14529, pp. 51-53) **A program for control and analysis of counting experiments.** Ehn, R. (Technische Univ., Vienna (Austria)); Roedlich, F.; Tagesen, P.; Tagesen, S. Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik. 1990. In *Institute for Radiation Research and Nuclear Physics. Progress report 1990.* 59p. Order Number DE95627524. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PROGRAMMING/decay; PROGRAMMING/radioactive materials; COUNTING RATES; DISTRIBUTION FUNCTIONS; MICROCOMPUTERS; PROGRAMMING; DECAY; RADIATION DETECTORS

17353 (IS–5109) **HINT: A new way to measure computer speed.** Gustafson, J.L.; Snell, Q.O. Ames Lab., IA (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95010245. Source: OSTI; NTIS; GPO Dep.

The computing community has long faced the problem of scientifically comparing different computers and different algorithms. When speeds or architectures or methods are very different, it is difficult or misleading to compare by taking the ratio of execution times, keeping all other things fixed. This paper presents a practical and fair approach that provides mathematically sound comparison of computational performance even when the algorithm, the computer, and the precision are changed. The HINT method removes the need for pseudo-work measures such as "Mflop/s" or "MIPS." It is designed to be particularly revealing of memory bandwidth and memory hierarchies. The scalability of HINT allows it to compare computing as slow as hand calculation to computing as fast as the largest supercomputer systems. It ports to every sequential and parallel programming environment with very little effort, permitting fair but low-cost comparison of any architecture capable of digital arithmetic.

17354 (JAERI-Data/Code–94-021) **Vectorization and improvement of nuclear codes. 3. DGR, STREAM V3.1, Cella, GGR.** Nemoto, Toshiyuki (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Eguchi, Norikuni; Watanabe, Hideo; Machida, Masahiko; Yokokawa, Mitsuo; Fujii, Minoru. Japan Atomic Energy Research Inst., Tokyo (Japan). Jan 1995. 125p. (In Japanese). Order Number DE95767954. Source: OSTI; NTIS; INIS.

In FORTRAN 77EX for FACOM VP2600 supercomputer.

Four nuclear codes have been vectorized and improved in order to realize the high speed performance on the VP2600 supercomputer at Computing and Information Systems Center of JAERI in the fiscal year 1993. Molecular Dynamics simulation code DGR which simulates the irradiation damage on diamond crystalline, three-dimensional non-steady compressible fluid dynamics code STREAM V3.1, two-dimensional fluid simulation code using Cell Automaton model Cella and Molecular Dynamics code GGR which simulates the irradiation damage on black carbon crystalline have been vectorized and improved, respectively. Speed up ratios by the vectorization to scalar mode on VP2600 show 2.8, 6.8-14.8, 15-16 and 1.23 times for DGR, STREAM V3.1, Cella and GGR, respectively. In this report, we present vectorization techniques, vectorization effects, evaluations of the numerical results and techniques for the improvement. (author).

17355 (JINR-E–2-94-417) **Electronic Guide for Nuclear Cross-Sections (Version 1994).** Barashenkov, V.S.; Polanski, A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 4p. Order Number DE95628146. Source: OSTI; NTIS (US Sales Only); INIS.

A short description of a fortran CROSEC code providing the integral cross-sections for pion-nucleus, nucleus-nucleus interactions (total, inelastic, elastic) is given. The hadron-nucleus cross-sections are obtained by means of interpolation between estimated experimental data at target charge numbers Z>3 and energies from 14 MeV up to 1 TeV. The nucleus-nucleus cross sections are calculated with the help of approximation formula with fitted coefficient at energies above several MeV/nucleons. The CROSEC code uses 168 KB RAM and can be used in interactive way to generate separate values or tables of cross sections on a display screen or file. Fractions of the CROSEC code can be used as subroutines employed by other codes. 8 refs.

17356 (JINR-E–11-90-204) **IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.** Rostovtsev, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. 95p. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

The abstracts of the reports made on IV International conference on computer algebra in physical research are presented. The capabilities of application of computers for algebraic computations in high energy physics and quantum field theory are discussed. Particular attention is paid to a software for the REDUCE computer algebra system.

17357 (JINR-E–11-90-204, pp. 23) **HECAS-2: new version of the computer algebra system for high energy physics.** Grudtsin, S.N.; Larin, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH ENERGY PHYSICS/computerized simulation; ALGEBRA; COMMUTATION RELATIONS; MANY-DIMENSIONAL CALCULATIONS

17358 (JINR-E–11-90-204, pp. 24) **Integrated system INTERCOMP and computer language for physicists.** Grudtsin, S.N.; Larin, V.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. HIGH ENERGY PHYSICS/programming languages; COMPUTER CODES; INFORMATION SYSTEMS

17359 (JINR-E–11-90-204, pp. 24) **Algebraic program DIRAC on IBM PC.** Grazin, A.G.; Perlit, H. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. D CODES/computer calculations; D CODES/tensors; TENSORS; EFFICIENCY; IBM COMPUTERS

17360 (JINR-E–11-90-204, pp. 59) **Symbolic computation of alternative Lagrangians.** Shorokhov, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. LAGRANGIAN FUNCTION; ALGORITHMS; VARIATIONS

17361 (JINR-E–11-90-204, pp. 63-64) **Complex REDUCE-programs for analytical solving some problems of beam transport system.** Urintsev, A.L.; Samojlov, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEAM TRANSPORT/r codes; CHROMATIC ABERRATIONS; MAGNETIC CIRCUITS

17362 (JINR-E–11-90-204, pp. 64) **Using REDUCE system for calculation of renormalized stress-energy tensor for matter fields in curved space-time.** Nesteruk, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ENERGY-MOMENTUM TENSOR/r codes; ENERGY-MOMENTUM TENSOR/space-time; COMPUTER CALCULATIONS; SPACE-TIME; IBM COMPUTERS; QUANTUM FIELD THEORY

17363 (JINR-E–11-90-204, pp. 73) **Determination of distribution parameters for W_n^2 and W_n^3 test statistics by the computer algebra application.** Zrelov, P.V.; Ivanov, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DISTRIBUTION FUNCTIONS/data processing; DISTRIBUTION FUNCTIONS/r codes; ALGEBRA; HIGH ENERGY PHYSICS; STATISTICS

17364 (JINR-E–11-90-204, pp. 76) **ACS OPUS use for nonlinear particle dynamic analysis.** Dubrovskij, A.S.; Provorov, L.V.; Shironosov, V.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEAM DYNAMICS/nonlinear problems; BEAM DYNAMICS/o codes; COMPUTER CALCULATIONS; IBM COMPUTERS

17365 (JINR-E–11-90-204, pp. 77) **Group classification of nonlinear differential systems personal computer.** Barmin, A.A.; Topunov, V.L.; Shishkov, D.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SYMMETRY GROUPS/computer calculations; NONLINEAR PROBLEMS; PLASMA SIMULATION

17366 (JINR-E–11-90-204, pp. 92-93) **Application of analytic computer calculations for synthesis of fast-acting devices for useful events selection in high energy physics spectrometers.** Kozubskij, K.E.; Nikityuk, N.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. (CONF-9005461–: 4. International Conference on Computer Algebra in Physical Research, Dubna (Russian Federation), 22-26 May 1990). In *IV International Conference on Computer Algebra in Physical Research. Collection of abstracts.* 95p. Order Number DE95626776. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MICROPROCESSORS/data processing; COMPUTER CALCULATIONS; HIGH ENERGY PHYSICS; MICROPROCESSORS; SPECTROMETERS

17367 (JINR-E–11-94-389) **Second-Order Learning Methods for a Multilayer Perceptron.** Ivanov, V.V.; Purehvdorzh, B.; Puzynin, I.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 10p. Order Number DE95627099. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Matematicheskoe Modelirovanie.

First- and second-order learning methods for feed-forward multilayer neural networks are studied. Newton-type and quasi-Newton algorithms are considered and compared with commonly used back-propagation algorithm. It is shown that, although second-order algorithms require enhanced computer facilities, they provide better convergence and simplicity in usage. 13 refs., 2 figs., 2 tabs.

17368 (JINR-E–11-94-397) **Computation of the Magnetic Field of a Spectrometer in Detectors Region.** Zhidkov, E.P.; Yuldasheva, M.B.; Yudin, I.P.; Yuldashev, O.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 18p. Order Number DE95627095. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods in Physics Research. Section A, Accelerators, Spectrometers, Detectors and Associated Equipment.

Computed results of the 3D magnetic field of a spectrometer intended for investigation of hadron production of charmed particles and the indication of the narrow resonances in neutron-nucleus interaction are presented. The methods, used in computations - finite element method and finite element method with suggested new infinite elements are described. For accuracy control the computations were carried out on a sequence of three-dimensional meshes. Special attention is devoted to the behaviour of the magnetic field in the basic detectors (proportional chambers) region. The performed results can be used for the field behaviour estimate of similar spectrometer magnets. 12 refs., 16 figs.

17369 (JINR-R–10-94-374) **CORDIS - a Program of True Distributions Unfolding from Experimental Data Distorted by Detectors with Finite Resolution.** Gagunashvili, N.D.; Tikhanin, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1994. 12p. (In Russian). Order Nu.nber DE95627096. Source: OSTI; NTIS (US Sales Only); INIS.

A program for unfolding the true distribution from experimental data distorted by a detector is described. For the given detector a result is obtained by the least squares method, hence, without bias and involving minimal statistical errors. Stability of the result is achieved at the expense of its information content and/or using additional information on the shape of the distribution to be measured. (author). 4 refs.

17370 (JINR-R–10-94-416) **Use of UNIX on the Controlling Computer of the MUSPIN Setup.** Ol'shevskij, V.G.; Pomyakushin, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 7p. (In Russian). Order Number DE95628149. Source: OSTI; NTIS (US Sales Only); INIS.

Multitasking Unix-like OS FreeBSD is proposed for the CAMAC modules management as an alternative of single job MS-DOS environment. Particular method of operation with KK012 controllers at the MUSPIN spectrometer is described. Experience of the performed experiments has shown advantages of the developed approach. 3 refs.

17371 (JINR-R–11-94-435) **Method for Numerical Solving of Three-Dimensional Polaron Equations.** Akishin, P.G.; Puzynin, I.V.; Smirnov, Yu.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 12p. (In Russian). Order Number DE95628147. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zhurnal Vychislitel'noj Matematiki i Matematicheskoj Fiziki.

An iterative method for numerical investigation of the spherically-nonsymmetric polaron in the limit of strong coupling is proposed. An expansion in spherical harmonics is used for an approximation of the solution. An originality of the method consists in creating an iterative Newtonian scheme with an additional parametrization of the initial equation, owing to that a transition from a simple linear problem to the initial nonlinear one is fulfilled. A classification for solutions of the problem is constructed in accordance with a numeration of the spherical harmonics. The testing calculations for various parameters of the problem and a comparison of obtained results with famous ones confirm the efficiency of the elaborated algorithms. 13 refs., 1 fig., 3 tabs.

17372 (LA–12930-C) **High performance systems.** Vigil, M.B. (comp.). Los Alamos National Lab., NM (United States). Mar 1995. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9404252–: Conference on high speed computing, Gleneden Beach, OR (United States), 18-21 Apr 1994). Order Number DE95009523. Source: OSTI; NTIS; GPO Dep.

This document provides a written compilation of the presentations and viewgraphs from the 1994 Conference on High Speed Computing given at the High Speed Computing Conference, "High Performance Systems," held at Gleneden Beach, Oregon, on April 18 through 21, 1994.

17373 (LA-UR–94-3256) **A two-timescale approach to nonlinear Model Predictive Control.** Buescher, K.L.; Baum, C.C. Los Alamos National Lab., NM (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950653–1: 1995 American control conference, Seattle, WA (United States), Jun 1995). Order Number DE95000943. Source: OSTI; NTIS; GPO Dep.

Model Predictive Control (MPC) schemes generate controls by using a model to predict the plant's response to various control strategies. A problem arises when the underlying model is obtained by fitting a general nonlinear function, such as a neural network, to data: an exorbitant amount of data may be required to obtain accurate enough predictions. We describe a means of avoiding this problem that involves a simplified plant model which bases its predictions on averages of past control inputs. This model operates on a timescale slower than- the rate at which the controls are updated and the plant outputs are sampled. Not only does this technique give better closed-loop performance from the same amount of open-loop data, but it requires far less on-line computation as well. We illustrate the usefulness of this two-timescale approach by applying it to a simulated exothermic continuously stirred tank reactor with jacket dynamics.

17374 (LA-UR–94-4088) **Bicriteria network design problems.** Marathe, M.V.; Ravi, R.; Sundaram, R.; Ravi, S.S.; Rosenkrantz, D.J.; Hunt, H.B. III. Los Alamos National Lab., NM (United States). [1994]. 16p. Sponsored by USDOE, Washington,

DC (United States);Department of Defense, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. DARPA Contract N0014-92-J-1799; NSF Grant CCR 92-12184; NSF Gran (CONF-950644–1: Conference on functional programming languages and computer architectures, La Jolla, CA (United States), 26-28 Jun 1995). Order Number DE95005261. Source: OSTI; NTIS; GPO Dep.

We study several bicriteria network design problems phrased as follows: given an undirected graph and two minimization objectives with a budget specified on one objective, find a subgraph satisfying certain connectivity requirements that minimizes the second objective subject to the budget on the first. Define an (α, β)-approximation algorithm as a polynomial-time algorithm that produces a solution in which the first objective value is at most α times the budget, and the second objective value is at most α times the minimum cost of a network obeying the budget oil the first objective. We, present the first approximation algorithms for bicriteria problems obtained by combining classical minimization objectives such as the total edge cost of the network, the diameter of the network and a weighted generalization of the maximum degree of any node in the network. We first develop some formalism related to bicriteria problems that leads to a clean way to state bicriteria approximation results. Secondly, when the two objectives are similar but only differ based on the cost function under which they are computed we present a general parametric search technique that yields approximation algorithms by reducing the problem to one of minimizing a single objective of the same type. Thirdly, we present an O(log n, log n)-approximation algorithm for finding a diameter-constrained minimum cost spanning tree of an undirected graph on n nodes generalizing the notion of shallow, light trees and light approximate shortest-path trees that have been studied before. Finally, for the class of treewidth-bounded graphs, we provide pseudopolynomial-time algorithms for a number of bicriteria problems using dynamic programming. These pseudopolynomial-time algorithms can be converted to fully polynomial-time approximation schemes using a scaling technique.

17375 (LA-UR–95-20) **Periodically specified problems: An exponential complexity gap between exact and approximate solutions.** Hunt, H.B. III (Univ. at Albany, NY (United States). Dept. of Computer Science); Rosenkrantz, D.J.; Stearns, R.E.; Marathe, M.V.; Radhakrishnan, V. Los Alamos National Lab., NM (United States). 28 Nov 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. National Science Foundation Grant CCR 89-03319; Grant CCR 89-052 (CONF-9503122–1: 27. ACM annual symposium on theory of computing (STOC), Livermore, CA (United States), Mar 1995). Order Number DE95009435. Source: OSTI; NTIS; GPO Dep.

We study both the complexity and approximability of various graph and combinatorial problems specified using two dimensional narrow periodic specifications (see [CM93, HW92, KMW67, KO91, Or84b, Wa93]). The following two general kinds of results are presented. (1) We prove that a number of natural graph and combinatorial problems are NEXPTIME- or EXPSPACE-complete when instances are so specified; (2) In contrast, we prove that the optimization versions of several of these NEXPTIME-, EXPSPACE-complete problems have polynomial time approximation algorithms with constant performance guarantees. Moreover, some of these problems even have polynomial time approximation schemes. We also sketch how our NEXPTIME-hardness results can be used to prove analogous NEXPTIME-hardness results for problems specified using other kinds of succinct specification languages. Our results provide the first natural problems for which there is a proven exponential (and possibly doubly exponential) gap between the complexities of finding exact and approximate solutions.

17376 (LA-UR–95-38) **Off-training-set error for the Gibbs and the Bayes optimal generalizers.** Grossman, T. (Los Alamos National Lab., NM (United States)); Knill, E.; Wolpert, D. Los Alamos National Lab., NM (United States). 3 Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950778–1: ACM conference on computational learning theory, Santa Cruz, CA (United States), Jul 1995). Order Number DE95006344. Source: OSTI; NTIS; GPO Dep.

In this paper we analyze the average off-training-set behavior of the Bayes-optimal and Gibbs learning algorithms. We do this by exploiting the concept of refinement, which concerns the relationship between probability distributions. For non-uniform sampling distributions the expected off training-set error for both learning algorithms can rise with, training set size. However we show in this paper that for uniform sampling and either algorithm, the expected error is a non-increasing function of training set size. For uniform sampling distributions, we also characterize the priors for which the expected error of the Bayes-optimal algorithm stays constant. In addition we show that when the target function is fixed, expected off-training-set error can increase with training set size if and only if the expected error averaged over all targets decreases with training set size. Our results hold for arbitrary noise and arbitrary loss functions.

17377 (LA-UR–95-423) **Training neural networks using sequential extended Kalman filtering.** Plumer, E.S. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950789–1: 1995 world congress on neural networks, Washington, DC (United States), Jul 1995). Order Number DE95007874. Source: OSTI; NTIS; GPO Dep.

Recent work has demonstrated the use of the extended Kalman filter (EKF) as an alternative to gradient-descent backpropagation when training multi-layer perceptrons. The EKF approach significantly improves convergence properties but at the cost of greater storage and computational complexity. Feldkamp et al. have described a decoupled version of the EKF which preserves the training advantages of the general EKF but which reduces the storage and computational requirements. This paper reviews the general and decoupled EKF approaches and presents sequentialized versions which provide further computational savings over the batch forms. The usefulness of the sequentialized EKF algorithms is demonstrated on a pattern classificatio.ı problem.

17378 (LA-UR–95-883) **Sensor fusion and nonlinear prediction for anomalous event detection.** Hernandez, J.V.; Moore, K.R.; Elphic, R.C. Los Alamos National Lab., NM (United States). 7 Mar 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950472–4: SPIE international symposium on aerospace/defense sensing and dual-use photonics, Orlando, FL (United States), 17-21 Apr 1995). Order Number DE95009429. Source: OSTI; NTIS; GPO Dep.

The authors consider the problem of using the information from various time series, each one characterizing a different physical quantity, to predict the future state of the system and, based on that information, to detect and classify anomalous events. They stress the application of principal components analysis (PCA) to analyze and combine data from different sensors. They construct both linear and nonlinear predictors. In particular, for linear prediction the authors use the least-mean-square (LMS) algorithm and for nonlinear prediction they use both backpropagation (BP) networks and fuzzy predictors (FP). As an application, they consider the prediction of gamma counts from past values of electron and gamma counts recorded by the instruments of a high altitude satellite.

17379 (LA-UR–95-1117) **Approaches to implementing deterministic models in a probabilistic framework.** Talbott, D.V. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950740–21: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95009483. Source: OSTI; NTIS; GPO Dep.

The increasing use of results from probabilistic risk assessments in the decision-making process makes it ever more important to eliminate simplifications in probabilistic models that might lead to conservative results. One area in which conservative simplifications are often made is modeling the physical interactions that occur during the progression of an accident sequence. This paper demonstrates and compares different approaches for incorporating deterministic models of physical parameters into probabilistic models; parameter range binning, response curves, and integral deterministic models. An example that combines all three approaches in a probabilistic model for the handling of an energetic

material (i.e. high explosive, rocket propellant,...) is then presented using a directed graph model.

17380 (ORNL/TM–12820) **A posteriori pointwise error estimates for the boundary element method.** Paulino, G.H. (Cornell Univ., Ithaca, NY (United States). School of Civil and Environmental Engineering); Gray, L.J.; Zarikian, V. Oak Ridge National Lab., TN (United States). Jan 1995. 39p. Sponsored by USDOE, Washington, DC (United States);Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (CNPq), Sao Paulo, SP (Brazil);National Science Foundation, Washington, DC (United States);Tennessee Univ., Knoxville, TN (United States). DOE Contract AC05-84OR21400. Order Number DE95008099. Source: OSTI; NTIS; GPO Dep.

This report presents a new approach for a posteriori pointwise error estimation in the boundary element method. The estimator relies upon the evaluation of hypersingular integral equations, and is therefore intrinsic to the boundary integral equation approach. This property allows some theoretical justification by mathematically correlating the exact and estimated errors. A methodology is developed for approximating the error on the boundary as well as in the interior of the domain. In the interior, error estimates for both the function and its derivatives (e.g. potential and interior gradients for potential problems, displacements and stresses for elasticity problems) are presented. Extensive computational experiments have been performed for the two dimensional Laplace equation on interior domains, employing Dirichlet and mixed boundary conditions. The results indicate that the error estimates successfully track the form of the exact error curve. Moreover, a reasonable estimate of the magnitude of the actual error is also obtained.

17381 **Stacked generalization.** Wolpert, D.H. To Dept. of Energy. 1993. Filed date 23 Mar 1993. U.S. Patent Application 8-035,837. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009983. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Stacked generalization is used to minimize the generalization errors of one or more generalizers acting on a known set of input values and output values representing a physical manifestation and a transformation of that manifestation, e.g., hand-written characters to ASCII characters, spoken speech to computer command, etc. Stacked generalization acts to deduce the biases of the generalizer(s) with respect to a known learning set and then correct for those biases. This deduction proceeds by generalizing in a second space whose inputs are the guesses of the original generalizers when taught with part of the learning set and trying to guess the rest of it, and whose output is the correct guess. Stacked generalization can be used to combine multiple generalizers or to provide a correction to a guess from a single generalizer.

17382 (PNL-SA–24897) **Visualization of parallel molecular dynamics simulation on a remote visualization platform.** Lee, T.Y. (Washington State Univ., Pullman, WA (United States)); Raghavendra, C.S.; Nicholas, J.B. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9409278–4: GVIS '94: graphics and visualization conference, Richland, WA (United States), 8 Sep 1994). Order Number DE95007806. Source: OSTI; NTIS; GPO Dep.

Visualization requires high performance computers. In order to use these shared high performance computers located at national centers, the authors need an environment for remote visualization. Remote visualization is a special process that uses computing resources and data that are physically distributed over long distances. In their experimental environment, a parallel raytracer is designed for the rendering task. It allows one to efficiently visualize molecular dynamics simulations represented by three dimensional ball-and-stick models. Different issues encountered in creating their platform are discussed, such as I/O, load balancing, and data distribution.

17383 (SAND–94-2205C) **Treatment of uncertainties in risk-based regulation.** Camp, A.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740–2: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95004523. Source: OSTI; NTIS; GPO Dep.

Over the past several years, we have begun to fully appreciate the value of probabilistic risk assessment (PRA) as a decision support tool. Risk assessment has allowed us to focus on problems of real importance and provided discipline to prioritization processes. Many government agencies now consider risk assessment as a normal and essential element of their decision making. Due to the inherent uncertainty in the results, use of absolute PRA numbers to make specific decisions was not encouraged by risk assessment experts in the past. The current trend , however, is to make more and more use of the absolute numbers and (in some cases) to use them directly to make regulatory decisions. Whether or not we approve of this trend, it will almost certainly continue. Therefore, it is incumbent upon risk assessment experts to provide information to decision-makers that is properly characterized. This characterization should include a clear presentation of the uncertainties involved in the risk estimates. Uncertainty analysis is often considered undesirable by decision-makers, because it muddies up the waters of an other-wise clear cut decision.

17384 (SAND–94-3129C) **A simple and efficient procedure for polyhedral assembly partitioning under infinitesimal motions.** Guibas, L.J. (Stanford Univ., CA (United States)); Halperin, D.; Latombe, J.C.; Hirukawa, Hirohisa; Wilson, R.H. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Grant IRI-9306544; Grant CCR-9215219. (CONF-9505193–4: 1995 international conference on robotics and automation, Nagoya (Japan), 21-27 May 1995). Order Number DE95009838. Source: OSTI; NTIS; GPO Dep.

The authors study the following problem: given a collection A of polyhedral parts in 3D, determine whether there exists a subset S of the parts that can be moved as a rigid body by an infinitesimal translation and rotation, without colliding with the rest of the parts, A/S. A negative result implies that the object whose constituent parts are the collection A cannot be taken apart with two hands. A positive result, together with the list of movable parts in S and a direction of motion for S, can be used by an assembly sequence planner. This problem has attracted considerable attention within and outside the robotics community. They devise an efficient algorithm to solve this problem. The solution is based on the ability to focus on selected portions of the tangent space of rigid motions and efficiently access these portions. The algorithm is complete (in the sense that it is guaranteed to find a solution if one exists), simple, and improves significantly over the best previously known solutions. The authors report experimental results with an implementation of their algorithm.

17385 (SAND–95-0140C) **Distributed multitasking ITS with PVM.** Fan, W.C.; Halbleib, J.A. Sr. Sandia National Labs., Albuquerque, NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950601–3: Annual meeting of the American Nuclear Society, Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95006821. Source: OSTI; NTIS; GPO Dep.

Advances of computer hardware and communication software have made it possible to perform parallel-processing computing on a collection of desktop workstations. For many applications, multitasking on a cluster of high-performance workstations has achieved performance comparable or better than that on a traditional supercomputer. From the point of view of cost-effectiveness, it also allows users to exploit available but unused computational resources, and thus achieve a higher performance-to-cost ratio. Monte Carlo calculations are inherently parallelizable because the individual particle trajectories can be generated independently with minimum need for interprocessor communication. Furthermore, the number of particle histories that can be generated in a given amount of wall-clock time is nearly proportional to the number of processors in the cluster. This is an important fact because the inherent statistical uncertainty in any Monte Carlo result decreases as the number of histories increases. For these reasons, researchers have expended considerable effort to take advantage of different parallel architectures for a variety of Monte Carlo radiation transport codes, often with excellent results. The initial interest in

this work was sparked by the multitasking capability of MCNP on a cluster of workstations using the Parallel Virtual Machine (PVM) software. On a 16-machine IBM RS/6000 cluster, it has been demonstrated that MCNP runs ten times as fast as on a single-processor CRAY YMP. In this paper, we summarize the implementation of a similar multitasking capability for the coupled electron/photon transport code system, the Integrated TIGER Series (ITS), and the evaluation of two load balancing schemes for homogeneous and heterogeneous networks.

17386 (SAND–95-0349C) **Evaluation of nonlinear structural dynamic responses using a fast-running spring-mass formulation.** Benjamin, A.S.; Altman, B.S.; Gruda, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950788–2: International conference on computational engineering science, Mauna Lani, HI (United States), 30 Jul - 3 aug 1995). Order Number DE95008503. Source: OSTI; NTIS; GPO Dep.

In today's world, accurate finite-element simulations of large nonlinear systems may require meshes composed of hundreds of thousands of degrees of freedom. Even with today's fast computers and the promise of ever-faster ones in the future, central processing unit (CPU) expenditures for such problems could be measured in days. Many contemporary engineering problems, such as those found in risk assessment, probabilistic structural analysis, and structural design optimization, cannot tolerate the cost or turnaround time for such CPU-intensive analyses, because these applications require a large number of cases to be run with different inputs. For many risk assessment applications, analysts would prefer running times to be measurable in minutes. There is therefore a need for approximation methods which can solve such problems far more efficiently than the very detailed methods and yet maintain an acceptable degree of accuracy. For this purpose, we have been working on two methods of approximation: neural networks and spring-mass models. This paper presents our work and results to date for spring-mass modeling and analysis, since we are further along in this area than in the neural network formulation. It describes the physical and numerical models contained in a code we developed called STRESS, which stands for "Spring-mass Transient Response Evaluation for structural Systems". The paper also presents results for a demonstration problem, and compares these with results obtained for the same problem using PRONTO3D, a state-of-the-art finite element code which was also developed at Sandia.

17387 (SAND–95-0492C) **The role of advanced engineering simulation in model-based design.** Hommert, P.J. (Sandia National Labs., Albuquerque, NM (United States). Engineering Sciences Center); Biffle, J.H. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503112–2: Agile Manufacturing conference (AMC '95), Albuquerque, NM (United States), 16-17 Mar 1995). Order Number DE95008815. Source: OSTI; NTIS; GPO Dep.

The agile manufacturing paradigm engenders many new concepts and work approaches for manufacturing operations. A technology often invoked in the concept of agility is modeling and simulation. Few would disagree that modeling and simulation holds the potential to substantially reduce the product development cycle and lead to improve product reliability and performance. Advanced engineering simulation can impact manufacturing in three areas: process design, product design, and process control. However, despite that promise, the routine utilization of modeling and simulation by industry within the design process is very limited. Advanced simulation is still used primarily in a troubleshooting mode examining design or process problems after the fact. Sandia National Laboratories has been engaged in the development of advanced engineering simulation tools for many years and more recently has begun to focus on the application of such models to manufacturing processes important for the defense industry. These efforts involve considerable interaction and cooperative research with US industry. Based upon this experience, this presentation examines the elements that are necessary for advanced engineering simulation to become an integral part of the design process.

17388 (SAND–95-0501C) **Toward a risk-based approach to the assessment of the surety of information systems.** Wyss, G.D.; Fletcher, S.K.; Halbgewachs, R.D.; Jansma, R.M.; Lim, J.J.; Murphy, M.; Sands, P.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950740–14: Joint ASME/JSME pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95008821. Source: OSTI; NTIS; GPO Dep.

Traditional approaches to the assessment of information systems have treated system security, system reliability, data integrity, and application functionality as separate disciplines. However, each areas requirements and solutions have a profound impact on the successful implementation of the other areas. A better approach is to assess the "surety" of an information system, which is defined as ensuring the "correct" operation of an information system by incorporating appropriate levels of safety, functionality, confidentiality, availability, and integrity. Information surety examines the combined impact of design alternatives on all of these areas. We propose a modelling approach that combines aspects of fault trees and influence diagrams for assessing information surety requirements under a risk assessment framework. This approach allows tradeoffs to be based on quantitative importance measures such as risk reduction while maintaining the modelling flexibility of the influence diagram paradigm. This paper presents an overview of the modelling method and a sample application problem.

17389 (SAND–95-0590C) **Encryption and networking applications.** Long, J.P. Sandia National Labs., Albuquerque, NM (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9505191–2: 17. Department of Energy computer security group training conference, Milwaukee, WI (United States), 1-4 May 1995). Order Number DE95009587. Source: OSTI; NTIS; GPO Dep.

The DOE requires that sensitive unclassified data be protected while being transmitted electronically. On most large networks it is difficult and expensive to provide the required level of physical protection. At Sandia National Laboratories, we are assembling the structure necessary to protect sensitive unclassified data using software-based encryption. This approach has the advantage that the data can be protected after arrival at its destination without additional investment While Sandia has expertise in cryptography, we had not used cryptography in this field. This discussion deals with the client-server model of file-based data exchange and interactive access to on-line data bases using Unix workstations, Macs and PCs.

17390 (SAND–95-8100) **Estimation in second order dependency model for multivariate binary data.** Ip, E.H.S. Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010326. Source: OSTI; NTIS; GPO Dep.

This paper proposes a normal model for multivariate binary data. The normal model is an extension to the bivariate normal model for 2×2 contingency table proposed by Pearson. A stochastic algorithm using Gibbs sampler is developed to estimate the parameters for high dimensional binary data. The method is compared to the second order dependency Bahadur-Lazarsfeld representation of binary density. Two examples, one from psychological testing and one from medical science, are used to substantiate the above ideas.

17391 (SAND–95-8101) **A stochastic difference equation approach to inference with missing data: Some new results.** Ip, E.H.S. (Stanford Univ., CA (United States). Dept. of Statistics); Diebolt, J. Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010327. Source: OSTI; NTIS; GPO Dep.

This paper is concerned with the study of the properties of the Stochastic EM estimator. The Stochastic EM estimator is an estimator derived from an iterative algorithm which handles statistical model with missing data. The first result we obtain is on the decomposition of a general stochastic difference equation underlying the Stochastic EM iterates into an additive form. Such decomposition allows a further analysis of the Markov chain underlying the

Stochastic EM algorithm. The second result indicates that the Stochastic EM estimator differs from the maximum likelihood estimate by O (1/n) where n is the sample size. It also shows that iterates derived from the additive stochastic difference equation converges to a normal distribution which is centered at the true value of the parameter as n → ∞.

17392 (SAND–95-8102) **A Stochastic EM algorithm for approximating the maximum likelihood estimate.** Diebolt, J. (Stanford Univ., CA (United States). Dept. of Statistics); Ip, E.H.S. Sandia National Labs., Livermore, CA (United States). Mar 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010328. Source: OSTI; NTIS; GPO Dep.

Stochastic EM is an algorithm designed to handle missing data in statistical applications. Instead of performing the expectation step in the Expectation-Maximization (EM) algorithm, Stochastic EM impute a sample value drawn from the conditional distribution of the missing data given the parameter. This paper explains how the algorithm can be applied in statistical inference to avoid numerical integrations and presents two examples using the Stochastic EM algorithm. The first example deals with censored Weibull data and the second example deals with an empirical Bayes model that arises in educational testing. Some variants of the algorithm are also discussed. This report only treats the theory underlying the Stochastic EM briefly. The properties of the Stochastic EM estimates are dealt with in depth in a sequel of this report.

17393 (SAND–95-8103) **A stochastic EM estimator in the presence of missing data - theory and applications.** Ip, E.H.S. (Stanford Univ., CA (United States). Dept. of Statistics). Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010329. Source: OSTI; NTIS; GPO Dep.

This thesis provides a study of a Monte Carlo version of the EM (for Expectation-Maximization) algorithm for handling complex missing-data structure in which high-dimensional integrations may be involved. Assuming a parametric model for the complete data, we propose a method for imputing values for missing data and then iteratively perform direct parametric inference based on the pseudo-complete data. If the iteration converges, the result of the procedure is a sample from a stationary distribution derived from the Markov chain formed by the iterations of the parameter. This algorithm is called Stochastic EM and the estimator we propose is the mean of the stationary distribution. We provide new theoretical results on the Stochastic EM estimator. First, under an exponential family setting, we show that asymptotically the Markov chain kernel of Stochastic EM can be decomposed into an additive stochastic difference equation. This decomposition allows us to provide useful results for the asymptotic behavior of the stationary distribution under specific conditions. The next result we obtain is that the Stochastic EM estimator is close to the maximum likelihood estimate. Another result shows that asymptotically the Stochastic EM iterations converge to a normal distribution with the true parameter as its mean. Bounds are obtained for the norm of the covariance matrix. There are two examples, one from medical science and one from education to substantiate the theory. In the education example, the use of straightforward EM would require performing an overwhelmingly large number of high-dimensional numerical integrations even for a moderate sample of a thousand multivariate binary observations.

17394 (SAND–95-8211) **Video conferencing using DAVE user's guide.** Friesen, J.A. Sandia National Labs., Livermore, CA (United States). Mar 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010341. Source: OSTI; NTIS; GPO Dep.

This guide is intended to provide information to new users of Sandia National Laboratories Distributed Audio Video Environment (DAVE) applications.

17395 (SAND–95-8218) **Congestion control over ATM local area networks.** Chen, H.Y.; Fang, C.; Hutchins, J.A. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010343. Source: OSTI; NTIS; GPO Dep.

Asynchronous Transfer Mode (ATM) has emerged as a standard which offers integration of different classes of service as well as scalability in terms of network size and speed. While the early focus on ATM was mainly on wide-area networks, the driving force behind this new technology is increasingly coming from local-area applications. The need for an ATM LAN to support existing protocols (e.g., TCP/IP) transparently is key to its adoption in the local-area environment. In traditional shared medium LANS, congestion control on the medium is handled by medium access control (MAC) protocol. Once a network device gains access to the shared medium, it has the full bandwidth to itself. Other contending network devices must wait until the shared medium becomes free. In ATM LANS, the MAC protocol is removed, and as a result the congestion control it provides is also removed. Each network device can transmit at the full link bandwidth, and can thus potentially cause congestion at some output ports of an ATM switch. This report presents some simulation results and demonstrates the importance of congestion control in ATM networks. First, we show the effects of cell loss on TCP performance in a congested ATM LAN. When congestion results in switch buffer overflow, cells are dropped. The effect of a small cell loss rate is found to translate into a much larger TCP packet retransmission rate, resulting in poor TCP performance. Secondly, we will describe a credit-based, per virtual circuit, per hop flow control algorithm proposed by Digital Equipment Corporation (DEC). We show that when flow control is employed, cell loss and TCP retransmissions are eliminated, resulting in greatly improved TCP performance.

17396 (SAND–95-8220) **A modification to the GMRES method for ill-conditioned linear systems.** Meza, J.C. Sandia National Labs., Livermore, CA (United States). Apr 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010661. Source: OSTI; NTIS; GPO Dep.

This paper concerns the use of a method for the solution of ill-conditioned linear systems. We show that the Generalized Minimum Residual Method (GMRES) in conjunction with a truncated singular value decomposition can be used to solve large nonsymmetric linear systems of equations which are nearly singular. Error bounds are given for the right singular vectors and singular values computed. A consequence of the error bounds results in a method for computing some of the singular values and right singular vectors for large matrices.

17397 (SINS–2153/8) **The Monte Carlo event generator for modelling the coherence and chaos in high energy hadronic and nuclear collisions.** Wilk, G. (Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland)); Wlodarczyk, Z.; Weiner, R.M. Soltan Inst. for Nuclear Studies, Otwock-Swierk (Poland). Sep 1993. 32p. Order Number DE95628887. Source: OSTI; NTIS; INIS.

The quantum statistical concepts of coherence and chaos used to describe fluctuations in multiparticle production processes are exhibited in a generalized version of the Interacting Gluon Model (IGM). The two components in the multiplicity distributions found previously are derived in this approach as originating from the two components of the energy flow existing in the IGM: the one provided by the interacting gluons and the other containing the initial valence quarks of the projectiles. The first Monte Carlo event generator with coherence and chaos built in is then presented and successfully used to describe the pp and p p-bar data. It is then generalized to hA and AA collisions and compared with data. (author). 62 refs, 16 figs, 1 tab.

17398 (SKB-TR–94-21) **Verification of HYDRASTAR: Analysis of hydraulic conductivity fields and dispersion.** Morris, S.T. (AEA Technology, Harwell (United Kingdom)); Cliffe, K.A. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Oct 1994. 74p. Order Number DE95627100. Source: OSTI; NTIS; INIS.

HYDRASTAR is a code for the stochastic simulation of groundwater flow. It can be used to simulate both time-dependent and steady-state groundwater flow at constant density. Realizations of the hydraulic conductivity field are generated using the Turning Bands algorithm. The realizations can be conditioned on measured

values of the hydraulic conductivity using Kriging. This report describes a series of verification studies that have been carried out on the code. The first study concerns the accuracy of the implementation of the Turning Bands algorithm in HYDRASTAR. The implementation has been examined by evaluating the ensemble mean and covariance of the generated fields analytically and comparing them with their prescribed values. Three other studies were carried out in which HYDRASTAR was used to solve problems of uniform mean flow and to calculate the transport and dispersion of fluid particles. In all three cases the hydraulic conductivity fields were unconditioned. The first two were two-dimensional: one at small values of the variance of the logarithm of the hydraulic conductivity for which there exists analytical results that the code can be compared with, and one at moderate variance where the results can only be compared with those obtained by another code. The third problem was three dimensional with a small variance and again analytical results are available for comparison. 14 refs, 24 figs.

17399 (SKB-TR–94-22) **Evaluation of stationary and non-stationary geostatistical models for inferring hydraulic conductivity values at Aespoe.** La Pointe, P.R. (Golder Associates Inc., Seattle, WA (United States)). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Nov 1994. 92p. Order Number DE95627101. Source: OSTI; NTIS; INIS.

This report describes the comparison of stationary and non-stationary geostatistical models for the purpose of inferring block-scale hydraulic conductivity values from packer tests at Aespoe. The comparison between models is made through the evaluation of cross-validation statistics for three experimental designs. The first experiment consisted of a 'Delete-1' test previously used at Finnsjoen. The second test consisted of 'Delete-10%' and the third test was a 'Delete-50%' test. Preliminary data analysis showed that the 3 m and 30 m packer test data can be treated as a sample from a single population for the purposes of geostatistical analyses. Analysis of the 3 m data does not indicate that there are any systematic statistical changes with depth, rock type, fracture zone vs non-fracture zone or other mappable factor. Directional variograms are ambiguous to interpret due to the clustered nature of the data, but do not show any obvious anisotropy that should be accounted for in geostatistical analysis. Stationary analysis suggested that there exists a sizeable spatially uncorrelated component ('Nugget Effect') in the 3 m data, on the order of 60% of the observed variance for the various models fitted. Four different nested models were automatically fit to the data. Results for all models in terms of cross-validation statistics were very similar for the first set of validation tests. Non-stationary analysis established that both the order of drift and the order of the intrinsic random functions is low. This study also suggests that conventional cross-validation studies and automatic variogram fitting are not necessarily evaluating how well a model will infer block scale hydraulic conductivity values. 20 refs, 20 figs, 14 tabs.

17400 (UCRL-CR–114243) **DOE Integrated Security System (DISS) preliminary communication security analysis.** Sweeney, D.J. Lawrence Livermore National Lab., CA (United States). Oct 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95009527. Source: OSTI; NTIS; GPO Dep.

The purpose of this analysis is to document a technical approach to improve DOE Integrated Security System (DISS) dial-up communications security and the requirements to address them. This document is not intended as a comprehensive analysis of the security aspects of the DISS computer system but rather as an analysis of the dial-up communications security as it pertains to the use of the DISS database in the new DOE Automated Visitors Access Control System (DAVACS) procedures. Current access controls into the DISS will be discussed with emphasis on the DAVACS procedures. Recommendations will be provided for increasing the dial-up communications security into DISS as it relates to the automated visit procedures. Finally a design for an encrypted dial-up communication link to DISS will be given.

17401 (UCRL-JC–116695) **Image enhancement by edge-preserving filtering.** Wong, Yiu-fai. Lawrence Livermore National Lab., CA (United States). Nov 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9411104–3: Institute of Electrical and Electronics Engineers (IEEE) international conference on image processing, Austin, TX (United States), 13-16 Nov 1994). Order Number DE95008077. Source. OSTI; NTIS; GPO Dep.

Image enhancement is useful when the details in an image are lost due to various reasons. It is common to subtract a mask from a given image to enhance the details. The trick is how to obtain a good mask. We describe here how an edge-preserving filter can be used to generate a mask which is smooth over areas with fine details, yet preserving most of the edges. Experiments with real images show that our scheme is very effective.

17402 (UCRL-JC–119529) **Implementation and performance of the pseudoknot problem in sisal.** Feo, J. (Lawrence Livermore National Lab., CA (United States)); Ivory, M. Lawrence Livermore National Lab., CA (United States). Dec 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9504126–1: High performance functional computing, Denver, CO (United States), 9-11 Apr 1995). Order Number DE95009573. Source: OSTI; NTIS; GPO Dep.

The Pseudoknot Problem is an application from molecular biology that computes all possible three-dimensional structures of one section of a nucleic acid molecule. The problem spans two important application domains: it includes a deterministic, backtracking search algorithm and floating-point intensive computations. Recently, the application has been used to compare and to contrast functional languages. In this paper, we describe a sequential and parallel implementation of the problem in Sisal. We present a method for writing recursive, floating-point intensive applications in Sisal that preserves performance and parallelism. We discuss compiler optimizations, runtime execution, and performance on several multiprocessor systems.

17403 (UCRL-JC–119773) **Automated volumetric grid generation for finite element modeling of human hand joints.** Hollerbach, K. (Lawrence Livermore National Lab., CA (United States)); Underhill, K.; Rainsberger, R. Lawrence Livermore National Lab., CA (United States). Feb 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9506173–1: 1995 ASME summer bioengineering conference, Beaver Creek, CO (United States), 28 Jun - 2 jul 1995). Order Number DE95009575. Source: OSTI; NTIS; GPO Dep.

We are developing techniques for finite element analysis of human joints. These techniques need to provide high quality results rapidly in order to be useful to a physician. The research presented here increases model quality and decreases user input time by automating the volumetric mesh generation step.

17404 (UCRL-JC–119879) **Visualization methods for high-resolution, transient, 3-D, finite element situations.** Christon, M.A. Lawrence Livermore National Lab., CA (United States). 10 Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9401114–1: International workshop on visualization, Paderborn (Germany), 18-20 Jan 1994). Order Number DE95009479. Source: OSTI; NTIS; GPO Dep.

Scientific visualization is the process whereby numerical data is transformed into a visual form to augment the process of discovery and understanding. Visualizing the data generated by large-scale, transient, three-dimensional finite element simulations poses many challenges due to geometric complexity, the presence of multiple materials and multiple element types, and the inherent unstructured nature of the meshes. In this paper, the direct use of finite element data structures, nodal assembly procedures, and element interpolants for volumetric adaptive surface extraction, surface rendering, vector grids and particle tracing is discussed. A brief description of a "direct-to-disk" animation system is presented, and case studies which demonstrate the use of isosurfaces, vector plots, cutting planes, reference surfaces and particle tracing are then discussed in the context of several case studies for transient incompressible viscous flow, and acoustic fluid-structure interaction simulations. An overview of the implications of massively parallel computers on visualization is presented to highlight the issues in parallel visualization methodology, algorithms. data locality and the

ultimate requirements for temporary and archival data storage and network bandwidth.

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Refer also to citation(s) 15021, 15034, 15090, 15300, 15310, 15379, 15773, 16459, 16649, 16650, 16651, 16859, 16883, 16884, 16940, 17207, 17292, 17293, 17294, 17295, 17296, 17297, 17298, 17299, 17300, 17301, 17302, 17303, 17305, 17306, 17307, 17308, 17321, 17326, 17327, 17328, 17349, 17388

17405 (CRIE-R–93010) **Development of customer information network system research on remote operation for customer.** Yoshimitsu, T. (Central Research Institute of Electric Power Industry, Tokyo (Japan)); Suzuki, T. Central Research Inst. of Electric Power Industry, Tokyo (Japan). Mar 1994. 24p. (In Japanese). Order Number DE95769746. Source: OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan.

A discussion was given on a customer-based information network to perform automatic meter-reading and provide information to electric power companies. As a first step, remote processing of operations accompanying visits was discussed as to methods of confirming and processing the operations. As a result, it was found that the following items may be performed by the remote processing: reading the power meters, notification of amount of power used and the power charge, processing such changes that are caused by house moving, handling of power failures in low voltage systems and inside the users' houses, requests on unpaid power charges, power transmission shutdown, resumption of power transmission, supply voltage measurement according to the electric power business law, insulation resistance survey in small users' houses, power leakage investigations, changes in the contract contents, and survey on work completion. In executing these items, it was thought necessary to have communicating functions for measuring voltages and currents and automatic meter-reading, as well as information exchange with customers. Remotely processing such events as handling power failures in low voltage systems, and changes in the contract capacity processed previously at the customers' place would be possible by monitoring and controlling different breakers. An image has been prepared for structures and functions for a system at users' ends for remote processing. 11 refs., 4 figs., 6 tabs.

17406 (CRIE-R–93011) **Utility broad-band network architecture and its OAM. Part 1.** Fukuda, M. (Central Research Institute of Electric Power Industry, Tokyo (Japan)); Kondo, T.; Horizawa, T.; Okamura, K.; Oba, E.; Inoue, Y. Central Research Inst. of Electric Power Industry, Tokyo (Japan). Mar 1994. 82p. (In Japanese). Order Number DE95769741. Source: OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan.

With an objective to install an ATM communications network for the future power transmission, investigations were made on the research trends in structuring the communications networks by means of the ATM transmission and exchange systems, and discussions were given on problems that the electric power companies should solve. The result of the investigation on the research trends on the ATM network revealed that the investigation placed the main point on the quality and flexibility of the communications, and more research is required on the necessary reliability of the power communications. Since the reliability required on each classified virtual path varies with respect to the method of evaluating the reliability in the power ATM communications network, it was found necessary that the reliability on impediment resistance and operation factors be evaluated on each virtual path network. It was made clear that the control technologies being studied for the public network may be applied to the traffic control. It was also disclosed that the operation and management of the power communications network require expansion in functions for the operation patterns and control systems characteristic to electric power. Furthermore, for the necessity in verifying the communication quality, a traffic investigation was carried out on the current power communications network. 57 refs., 26 figs., 11 tabs.

17407 (CRIE-R–93014) **Study of reliability evaluation on configuration of utility communication network.** Oba, E. (Central Research Institute of Electric Power Industry, Tokyo (Japan)). Central Research Inst. of Electric Power Industry, Tokyo (Japan). Mar 1994. 23p. (In Japanese). Order Number DE95769744. Source: OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan.

A discussion was given on indexes to accurately evaluate the reliability of a utility communication network, and a program to calculate the reliability was developed. The discussion was made on a method in which a utility communication network was expressed as a graph composed of nodes and links, and a physical network evaluated the reliability against impediments when expressed as described above. As a result, degrees of the linkage and the bonds were selected to express how many impediments that occur simultaneously the network can withstand to maintain the linkage of the communication network; a probability that communications are possible among all of the two nodes was used as an overall reliability to express quantitatively the degree of achievement of the communicating functions in the network when an impediment has occurred; and the ratio that shows how many sets of the nodes that are capable of communications during impediments remain was used as the functional operation factor. A program was developed to calculate the degrees of linkage and bond, the overall reliability, and the functional operation factor. A model network was used to calculate the effect of reliability improvement when links are added. 9 refs., 12 figs., 7 tabs.

17408 (DOE/ER/25063–T14) **Supporting data intensive applications with medium grained parallelism. Final report, July 1991–June 1994.** Pfaltz, J.L.; French, J.C.; Grimshaw, A.S.; Son, S.H. Virginia Univ., Charlottesville, VA (United States). School of Engineering and Applied Science. Jul 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER25063. (UVA–527437/CS95/101). Order Number DE95010164. Source: OSTI; NTIS; GPO Dep.

The purpose of this second three year grant was to investigate opportunities for medium grained parallelism in data intensive applications; or more succinctly, can one create effective parallel database systems? It should be noted that the last three years have not been kind to parallel object-oriented database systems – to their knowledge none of those that have been implemented has been particularly effective. Nevertheless, this research has been some of the most successful that the principal investigators have conducted. One reason is that the authors took a multi-way approach. In consequence, they seem to have made far more progress than comparable research groups. A second, implicit goal was to complete the innovative functional, object-oriented database language and system, called ADAMS, and to demonstrate its performance in a parallel environment. Thus the overall agenda was (a) to create new mechanisms that exploit parallel computing power, (b) install it in ADAMS, and (c) analyze its behavior. It will be seen, that while they did come up with several new innovative ideas which they thoroughly tested, they did not always have time to install them into the run-time ADAMS library. Although the authors proposed rewriting their storage manager to take advantage of the Concurrent File System (CFS) on the Intel iPSC/2, they did not. During the grant period, the Computer Science Department acquired a dedicated cluster of 8 SPARC 10's. Gradually the hypercube implementation has been phased out, and replaced by that on the SPARC cluster.

17409 (DOE/MC/29467–3986) **Management, visualization, and analysis of environmental and geotechnical data. Topical report.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Sep 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95000063. Source: OSTI; NTIS; GPO Dep.

This document is a topical report evaluating current technology on the management, visualization, and analysis of engineering and environmental data. This report gives an overview and assessment of the Integrated Computer Assisted Site Evaluation /Graphical Remedial Assessment and Cost Evaluation (ISACE/GRACE) system and includes brief descriptions of the Environmental Technology

'94: Computing and Information Conference and the National Conference on Environmental Problem Solving with GIS.

17410 (DOE/NV/10872–T176) **Adaptive image enhancement of text images that contain touching or broken characters.** Stubberud, P.; Kalluri, V.; Kanai, J. Nevada Univ., Las Vegas, NV (United States). 29 Nov 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE95010173. Source: OSTI; NTIS; GPO Dep.

Text images that contain touching or broken characters can significantly degrade the accuracy of optical character recognition (OCR) systems. This paper proposes an adaptive image restoration technique that can improve OCR accuracy by enhancing touching or broken character images. The technique begins by processing a distorted text image with an OCR system. Using the distorted text image and output information from the OCR system, an inverse model of the distortion that caused the touching or broken character problem is generated. After generating the inverse model, the unrecognized distorted characters are filtered by the inverse model and then processes by the OCR system. To demonstrate its feasibility, six distorted text images were processed using this technique. Four of the text images, two with touching characters and two with broken characters, were synthesized using mathematical distortion models. The remaining two distorted text images, one with touching characters and one with broken characters, were distorted using a photocopier. The performance of the adaptive image restoration technique was measured using pixel accuracy and OCR improvement. The examples demonstrate that this technique can improve both the pixel and OCR accuracy of text images containing touching or broken characters.

17411 (IAEA-NDS–107(rev.9)) **Index to BROND-2, CENDL-2, ENDF/B-6, JEF-2, JENDL-3, IRDF.** IAEA-NDS-Documentation series, IAEA-NDS-Documentation series. Lemmel, H.D. International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Jul 1994. 19p. Order Number DE95628876. Source: OSTI; NTIS (US Sales Only); INIS.

This document contains a brief index to the five main data libraries for evaluated neutron reaction data, including BROND-2 from USSR (1992 update), CENDL-2 from China (1993 version), ENDF/B-6 from USA (including 1993 revisions), JEF-2 from OECD/NEA (1992) and JENDL-3.2 (1994) from Japan. It also indexes IRDF-90, the International Reactor Dosimetry File from IAEA (1993 update), and the available data libraries for fission-product yield data. (author).

17412 (IAEA-NDS–150(rev.94/9)) **Online nuclear data service.** IAEA-NDS-Documentation series, IAEA-NDS-Documentation series. Dunford, C.L. (International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section); Burrows, T.W. International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. 1994. 90p. Order Number DE95628877. Source: OSTI; NTIS (US Sales Only); INIS.

The US National Nuclear Data Center and the IAEA Nuclear Data Section offer online computer access through international networks to their nuclear-physics and photo-atomic numeric databases, related bibliographic systems and other related information of interest to basic and applied research and technology. A detailed description of the access procedures, the technical requirements, and the available databases is given. (author).

17413 (IAEA-SM–317) **Opening statement by the scientific secretary.** Todeschini, C. (International Atomic Energy Agency, Vienna (Austria). INIS Section). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 12p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628860. Source: OSTI; NTIS (US Sales Only); INIS.

The International Symposium on the Future of Scientific, Technological and Industrial Information Services was co sponsored by four International Organizations: IAEA, FAO, UNESCO and UNIDO. The involvement of each of these Organizations in information transfer activities is described. The main three themes of the symposium: Information needs of users, Information retrieval and dissemination systems, Information management and strategy, are briefly presented.

17414 (IAEA-SM–317/1) **Evolution of scientific and technological documentation services at ENEA.** Sano, A. (ENEA, Rome (Italy)); Li Puma, G. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 10p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628861. Source: OSTI; NTIS (US Sales Only); INIS.

The expected evolution of documentation and information Centers in research Organizations is presented, on the base of experience matured at ENEA (Italy) in this field. The growth of the available information, consequent to the integration of different information systems, to the realization of library network, to the increase of on-line data bases, the evolution of interfaces between information and users, and the growth of the capacity of Centers to understand in depth the information they manage (capability to analyse, validate and elaborate the data), represents the main aspects of the evolution of this sector. The role of Centers is then changing shifting gradually from the management of documentation to the management of information. New professional skills are therefore necessary in the Centers. Competences in computer science and in other areas of major interest to the Organization are requested. In this way the Centers tend to become an active information point reference in the life of the Organization and have a specific role of notable interest and responsibility. (author). 3 figs.

17415 (IAEA-SM–317/4) **Conversion and distribution of bibliographic information for further use on microcomputers with database software such as CDS/ISIS.** Nieuwenhuysen, P. (Vrije Univ., Brussels (Belgium)); Besemer, H. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 6p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628866. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes methods to work on microcomputers with data obtained from bibliographic and related databases distributed by online data banks, on CD-ROM or on tape. Also, we mention some user reactions to this technique. We list the different types of software needed to perform these services. Afterwards, we report about our development of software, to convert data so that they can be entered into UNESCO's program named CDS/ISIS (Version 2.3) for local database management on IBM microcomputers or compatibles; this software allows the preservation of the structure of the source data in records, fields, subfields and field occurrences. (author). 10 refs, 1 fig.

17416 (IAEA-SM–317/7) **Toward common working tools: Arab League Documentation and Information Centre experience.** Redissi, M. (ALDOC (Tunisia)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 16p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628874. Source: OSTI; NTIS (US Sales Only); INIS.

The adoption of Arab common working tools in information handling has been one of the priorities of Arab League Documentation and Information Centre (ALDOC). Problems arising from the processing of Arabic language have been progressively settled. The Tunisian experience in the elimination of transliteration is worth mentioning. (author). 17 refs.

17417 (IAEA-SM–317/10) **The use of CD-ROMs for storage and document delivery at the British Library Document Supply Centre.** Bradbury, D. (British Library Document Supply Centre, Boston SPA (United Kingdom)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 12p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628862. Source: OSTI; NTIS (US Sales Only); INIS.

The British Library Document Supply Centre (BLDSC) has been in the forefront of international document delivery for 20 years. During the last 5 years it has been very actively involved in the ADONIS Project, through which the full text of some 200 journals in the life sciences have been stored, accessed, and delivered through the medium of CD-ROM. The BLDSC's involvement in this project is described and indications of the lessons learned and of the implications for international document delivery systems in the future are given. (author).

17418 (IAEA-SM–317/11) **Spectroscopic databases - A tool for structure elucidation.** Luksch, P. (Fachinformationszentrum Karlsruhe, Gesellschaft fuer Wissenschaftlich-Technische Information mbH, Eggenstein-Leopoldshafen (Germany)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 12p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628878. Source: OSTI; NTIS (US Sales Only); INIS.

Spectroscopic databases have developed to useful tools in the process of structure elucidation. Besides the conventional library searches, new intelligent programs have been added, that are able to predict structural features from measured spectra or to simulate for a given structure. The example of the C13NMR/IR database developed at BASF and available on STN is used to illustrate the present capabilities of online database. New developments in the field of spectrum simulation and methods for the prediction of complete structures from spectroscopic information are reviewed. (author). 10 refs, 5 figs.

17419 (IAEA-SM–317/14) **Information needs of engineers. The methodology developed by the WFEO Committee on Engineering Information and the use of value analysis for improving information services.** Darjoto, S.W. (Indonesian Inst. of Sciences, Bandung (Indonesia)); Martono, A.; Michel, J. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 9p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628863. Source: OSTI; NTIS (US Sales Only); INIS.

The World Federation of Engineering Organizations - WFEO - through the work of its Committee on Engineering Information, aims at improving the efficiency of engineers and particularly at developing new attitudes and practices concerning the specialized information mastering. One important part of the WFEO/CEI programme of activities during the last years and for the next years was and is devoted to a better understanding of the information needs of engineers. But also, it seems now essential to WFEO/CEI to better evaluate information services in order to correctly adapt them to the identified needs of engineers. The following communication will emphasize these two main and related perspectives: identifying the information needs of engineers; developing Value Analysis approaches for engineering information services. (author). 3 refs.

17420 (IAEA-SM–317/29) **Information retrieval and services with the help of the ASPID–5/ES and ASPID-7/SM software for mainframe or mini-computer.** Grigyanets, R.V. (AN Belorusskoj SSR, Minsk (Belarus). Inst. Matematiki); Kvachuk, K.P.; Makarevich, G.V. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 12p. (In Russian). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628864. Source: OSTI; NTIS (US Sales Only); INIS.

The paper considers structure of information base, functions and features of ASPID-5/EC (Automated Systems of Information Search using Descriptors) and ASPID-7/SM complexes. 1 fig.

17421 (IAEA-SM–317/37) **A case study in information needs of ISTIC users.** Tao Jin (The Institute of Scientific and Technical Information of China, Beijing (China)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 14p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628865. Source: OSTI; NTIS (US Sales Only); INIS.

This paper is based on the investigation of users in a practical information service, the Institute of Scientific and Technical Information of China, and it analysed users' document utilization in the year 1989. Its major contents include: the basic situation of document utilization of Chinese S and T personnel; the barriers encountered; the patterns that the documents are used. The author pointed out the existing problems and offered some suggestions in information work. (author). 4 refs, 3 figs, 2 tabs.

17422 (IAEA-SM–317/44) **Concept of automated system development for production and processing of scientific and technical data texts.** Gorbatov, V.S. (Moskovskij Inzhenerno-Fizicheskij Inst., Moscow (Russian Federation)); Malyuk, A.A. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 10p. (In Russian). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628867. Source: OSTI; NTIS (US Sales Only); INIS.

The paper considers issues of creation of local subject oriented databases, for which the principle of auto formalization of knowledge and corresponding technique of personal calculations is a methodological and technical base. 1 tab.

17423 (IAEA-SM–317/45) **Development prospects of automated data service in the USSR.** Gusev, O.S. (State Committee for Science and Technology, Moscow (Russian Federation)). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (In Russian). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628868. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. USSR/information systems; COMPUTER NETWORKS; DATA BASE MANAGEMENT; INFORMATION CENTERS; INTERNATIONAL COOPERATION; PLANNING; USSR

17424 (IAEA-SM–317/47) **Information technology and software of automated library information network of USSR scientific and technical libraries.** Rostovtsev, V.M. (Gosudarstvennaya Publichnaya nauchno-Tekhnicheskaya Biblioteka

(GPNTB SSSR), Moscow (Russian Federation)); Shrajberg, Ya.L. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (In Russian). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628869. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIBRARIES/information systems; AUTOMATION; DATA BASE MANAGEMENT; INFORMATION CENTERS; LIBRARIES; USSR

17425 (IAEA-SM–317/53) **Analytical information for management of a scientific research institute.** Ilienko, E.I. (Radievyj Inst., Leningrad (Russian Federation)); Kolokoltsov, V.B.; Tsaritsyna, L.G. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628870. Source: OSTI; NTIS (US Sales Only); INIS.

The activity of the scientific-technical information analysis group at the Radium Institute (Leningrad, USSR) to respond to the information needs of managers is briefly described.

17426 (IAEA-SM–317/55) **The state and development perspectives for an integrated information delivery system in the field of nuclear science and technology in the USSR.** Terent'ev, V.G. (TsNIIatominform, Moscow (Russian Federation)); Romanov, V.S.; Mikhnevich, O.G.; Kiptenko, V.A.; Reshet'ko, Yu.V.; Pavlov, A.N.; Chizhova, N.P.; Serdobol'skij, G.K. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 2p. (In Russian). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628871. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR ENERGY/information systems; DATA BASE MANAGEMENT; INFORMATION CENTERS; INFORMATION DISSEMINATION; INFORMATION NEEDS; INFORMATION RETRIEVAL; INTERNATIONAL COOPERATION; USSR

17427 (IAEA-SM–317/56) **Multilingual indexing and retrieval in bibliographic retrieval systems: The AGRIS experience.** Bonnichon, M.; Lebowitz, A.I.; Portegies Zwart, R.; Schmid, H. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 8p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628872. Source: OSTI; NTIS (US Sales Only); INIS.

In the field of agriculture, experience with AGRIS has shown that the language barrier is among thr greatest obstacles to preparing input to the database as well as to using its output products. The implementation of the multilingual thesaurus AGROVOC in AGRIS is described in this paper.

17428 (IAEA-SM–317/57) **Interaction between national and international information systems: The case of AGRIS and CARIS.** Samaha, E.K. (Food and Agriculture Organization of the United Nations, Rome (Italy). Library and Documentation Systems Div.). International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 3p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628880. Source: OSTI; NTIS (US Sales Only); INIS.

The international cooperative information system as exemplified by IAEA's INIS and FAO's AGRIS and CARIS is based on national partnership. A unique type of interaction exists between this system and national systems. This paper outlines this relationship with examples drawn from AGRIS and CARIS, and looks at future prospects in the 1990s.

17429 (IAEA-SM–317/58) **Expert system for quality control in the INIS database.** Todeschini, C. (International Atomic Energy Agency, Vienna (Austria)); Tolstenkov, A. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 17p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628881. Source: OSTI; NTIS (US Sales Only); INIS.

An expert system developed to identify input items to INIS database with a high probability of containing errors is described. The system employs a Knowledge Base constructed by the interpretation of a large number of intellectual choices or expert decisions made by human indexers and incorporated in the INIS database. On the basis of the descriptor indexing, the system checks the correctness of the categorization. A notable feature of the system is its capability of self improvement by the continuous updating of the Knowledge Base. The expert system has also been found to be extremely useful in identifying documents with poor indexing. 3 refs, 9 figs.

17430 (IAEA-SM–317/63) **User needs in chemical information.** Lehmann, H. (FIZ Chemie GmbH, Berlin (Germany)); Poetzscher, G.; Wilson, A.J.C. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 25p. (CONF-900550–: International symposium on the future of scientific, technological and industrial information services, Leningrad (USSR), 28-31 May 1990). Order Number DE95628873. Source: OSTI; NTIS (US Sales Only); INIS.

Information has become an absolutely indispensable factor in the modern industrial society. In chemistry, detailed information about all compounds known is required. Learned journals, research and conference reports, publications from universities and learned societies, and dissertations present the progress in research. It is important that all properties of compounds (stereochemistry, physical values, chemical and environmental behaviour, toxicity etc.) reported in these publications be indexed and made available to the users. There is also a need for factual and/or numerical data and reviews concerning general or specific topics. High on the list of desiderata are timeliness, accuracy and completeness of the information. Abstracting and indexing services and database producers have to take in consideration that a high degree of user-friendliness is necessary. In the future, most of the information will be offered in computer readable form (factual and numerical databases, reaction databases, information on CD-ROM etc.), a fact which will require many improvements in the flow of information in order to render possible an easy and direct access to the chemical information worldwide. (author). 15 refs.

17431 (IAEA-SM–317/76) **Databases in the documentation management for big industrial projects.** Cauchet, A. (Societe EURODOC, Saint Quentin en Yvenlines (France)); Chevillard, F.; Parisot, Y.; Tirefort, C. International Atomic Energy Agency, Vienna (Austria); Food and Agriculture Organization of the United Nations, Rome (Italy); United Nations Educational, Scientific and Cultural Organization (UNESCO), 75 - Paris (France); United Nations Industrial Development Organization, Vienna (Austria). May 1990. 12p. (In French). (CONF-900550–: International symposium on the future of scientific, technological and industrial information services,

Leningrad (USSR), 28-31 May 1990). Order Number DE95628875. Source: OSTI; NTIS (US Sales Only); INIS.

The documentation management of a big industrial project involves a continuous update of information, both in the study and realization phase or in the operation phase. The organization of the technical documentation for big industrial projects requests complex information systems. In the first part of this paper are presented the methods appropriate for the analysis of documentation management procedures and in the second part are presented the tools by the combination of which a documentation system for the user is provided. The case of the documentation centres for the Hague reprocessing plant is described.

17432 (INDC(NDS)–320) **Establishment of an international reference data library of nuclear activation cross sections. Summary report of the first research co-ordination meeting held in Debrecen, Hungary, from 4 to 7 October 1994.** Pashchenko, A.B. International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Feb 1995. 28p. (CONF-9410342–: 1. research co-ordination meeting on establishment of an international reference data library of nuclear activation cross sections, Debrecen (Hungary), 4-7 Oct 1994). Order Number DE95628879. Source: OSTI; NTIS (US Sales Only); INIS.

The report contains the Summary of the First IAEA Research Co-ordination Meeting (RCM) of the new Co-ordinated Research Programme (CRP) on "Establishment of an International Reference Data Library of Nuclear Activation Cross Sections". The meeting was organized by the IAEA Nuclear Data Section with co-operation and assistance of local organizers from the Institute of Experimental Physics and held in Debrecen, Hungary, from 4 to 7 October 1994. The purpose of the RCM was to discuss the scope and goals of the CRP, to report and evaluate the first results of the research carried out by each participating laboratory, to review the current tasks, identify further actions of participants and agree on the coordination of work under this CRP. The detailed agenda, the list of participants, conclusions and recommendations of the meeting are presented in the summary report. (author).

17433 (INIS-mf–14504) **Nuclear data newsletter. No. 18.** International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Nov 1993. 13p. Order Number DE95628142. Source: OSTI; NTIS (US Sales Only); INIS.

This issue of the Nuclear Data Newsletter dated November 1993 gives information on the following topics: data indexes and bibliographies, new nuclear data libraries received including a package of three data libraries on photon-electron interaction, a list of selected new publications on nuclear data.

17434 (INIS-mf–14505) **Nuclear data newsletter. No. 19.** International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Sep 1994. 12p. Order Number DE95628143. Source: OSTI; NTIS (US Sales Only); INIS.

This issue of the Nuclear Data Newsletter dated September 1994 contains information on the following topics: WRENDA 93/94, online nuclear data service, data indexes and bibliographies, new nuclear data libraries received, a list of publications on nuclear data libraries grouped by type and field.

17435 (SAND–94-3125) **Summary report for the viability of asynchronous transfer mode (ATM) in local area network (LAN) environments Laboratory Directed Research and Development Project.** Gossage, S.A.; Naegle, J.H.; Testi, N.; Tarman, T.D. Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95009664. Source: OSTI; NTIS; GPO Dep.

This report summarizes the activities of a Lab Directed Research and Development (LDRD) Project to investigate the viability of asynchronous transfer mode (ATM) switching technology in the local area network (LAN) environment. A number of ATM based LANs were constructed and their performance capabilities were measured. The summary report notes the measurements and lessons learned from the two-year effort.

17436 (SAND–95-0305C) **Risk-based assessment of the surety of information systems.** Jansma, R.; Fletcher, S.; Halbgewachs, R.; Lim, J.; Murphy, M.; Sands, P.; Wyss, G. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503111–1: Toward an electronic patient record '95, Orlando, FL (United States), 14-19 Mar 1995). Order Number DE95008545. Source: OSTI; NTIS; GPO Dep.

Correct operation of an information system requires a balance of "surety" domains – access control (confidentiality), integrity, utility, availability, and safety. However, traditional approaches provide little help on how to systematically analyze and balance the combined impact of surety requirements on a system. The key to achieving information system surety is identifying, prioritizing, and mitigating the sources of risk that may lead to system failure. Consequently, the authors propose a risk assessment methodology that provides a framework to guide the analyst in identifying and prioritizing sources of risk and selecting mitigation techniques. The framework leads the analyst to develop a risk-based system model for balancing the surety requirements and quantifying the effectiveness and combined impact of the mitigation techniques. Such a model allows the information system designer to make informed trade-offs based on the most effective risk-reduction measures.

17437 (SAND–95-0661C) **Scalable ATM encryption.** Sandia National Labs., Albuquerque, NM (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503129–1: Cray User Group spring conference, Denver, CO (United States), 15 Mar 1995). Order Number DE95009868. Source: OSTI; NTIS; GPO Dep.

In order to provide needed security assurances for traffic carried in Asynchronous Transfer Mode (ATM) networks, methods of protecting the integrity and privacy of traffic must be employed. Cryptographic methods can be used to assure authenticity and privacy, but are hard to scale and the incorporation of these methods into computer networks can severely impact functionality, reliability, and performance. To study these trade-offs, a research prototype encryptor/decryptor is under development. This prototype is to demonstrate the viability of implementing certain encryption techniques in high speed networks by processing Asynchronous Transfer Mode (ATM) cells in a SONET OC-3 payload. This paper describes the objectives and design trade-offs intended to be investigated with the prototype. User requirements for high performance computing and communication have driven Sandia to do work in the areas of functionality, reliability, security, and performance of high speed communication networks. Adherence to standards (including emerging standards) achieves greater functionality of high speed computer networks by providing wide interoperability of applications, network hardware, and network software.

17438 (SAND–95-0665C) **A proposed Generic Authentication Information Element.** Tarman, T.D. Sandia National Labs., Albuquerque, NM (United States). 10 Apr 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504139–2: ATM forum technical committee meeting, Denver, CO (United States), 10 Apr 1995). Order Number DE95009862. Source: OSTI; NTIS; GPO Dep.

This contribution describes a proposed information element that can convey authentication information within an ATM signaling message. The design of this information element provides a large amount of flexibility to the user because it does not specify a particular signature algorithm, and it does not specify which information elements must accompany the Authentication IE in a signaling message. This allows the user to implement authenicated signaling based on her site's security policies and performance requirements.

17439 (SAND–95-0666C) **Proposed DDS-specific fields for the Generic Authentication Information Element.** Tarman, T.D. Sandia National Labs., Albuquerque, NM (United States). 10 Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9504139–1: ATM forum technical committee meeting, Denver, CO (United States), 10 Apr 1995). Order Number DE95009839. Source: OSTI; NTIS; GPO Dep.

This contribution proposes the format of the "Algorithm-Specific Information" and "Signature" fields within the "Proposed Generic Authentication Information Element" for authentication IEs based on the Digital Signature Standard (DSS). These fields are designed to allow various levels of authentication "strength" (or robustness), and many of these fields may be omitted in systems that optimize authentication performance by sharing common (public) Digital Signature Algorithm (DSA) parameters. This allows users and site security officers to design their authenicated signaling according to site security and performance requirements.

17440 (WHC-SD-GN-PMP–30012) **QUEST2: Project plan for preliminary analysis/system architecture phase (PA/SA).** Braaten, F.D. Westinghouse Hanford Co., Richland, WA (United States). 8 Mar 1995. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008835. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Management Plan combines the project management deliverables from the P+ methodology that are applicable to this part of the QUEST2 work. This consolidation reflects discussions with WHC QA regarding an appropriate method for ensuring that P+ deliverables fulfill the intent of WHC-CM-3-10 and QR-19.

17441 (WHC-SD-WM-CSUD–010) **Computer software user document for Employee Position Requirements Tracking System (EMPORTS).** Davidson, S.M. Westinghouse Hanford Co., Richland, WA (United States). 13 Feb 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008049. Source: OSTI; NTIS; GPO Dep.

The Engineering and Projects Departments of ICF Kaiser have requested the development of a data base system to track training certification records of employees assigned to their respective divisions. The requested system is to provide division administrative staff with a flexible tool to track the status of employee completion of assigned project training and reading assignments based on established division/project discipline prerequisites. This user document provides instructions for EMPORTS program execution (log in and log off), entry and revision of data, generation of user reports, and modification of user access.

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17442 (IAEA–12-SP-384.37, pp. 58-85) **IAEA activity on operator support systems in nuclear power plants.** Dounaev, V. (Consyst Co., Ltd., Moscow (Russian Federation)); Fujita, Y.; Juslin, K.; Haugset, K.; Kossilov, A.; Lux, I. International Atomic Energy Agency, Vienna (Austria); Institutt for Energiteknikk, Halden (Norway). OECD Halden Reaktor Projekt. 1994. (CONF-9409318–: Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms, Halden (Norway), 13-15 Sep 1994). In *Proceedings of the International Atomic Energy Agency specialists' meeting on advanced information methods and artificial intelligence in nuclear power plant control rooms.* 301p. Order Number DE95627981. Source: OSTI; NTIS (US Sales Only); INIS.

Various operator support systems for nuclear power plants are already operational or under development in the IAEA Member States. Operator support systems are based on intelligent data processing and, in addition to plant operation, they are also becoming more important for safety. A key feature of operator support systems is their availability to restructure data to increase its relevance for a given situation. This can improve the user's ability to identify plant mode, system state, and component state and to identify and diagnose faults. Operator support systems can also assist the user in planning and implementing corrective actions to improve the nuclear power plant's availability and safety. In September 1991, the IAEA Committee for Contractual Scientific Services approved the Co-ordinated Research Programme (CRP) on "Operator Support Systems in Nuclear Power Plants" in the framework of the Project "Man-Machine Interface Studies". The main objective of this programme is to provide guidance and technology transfer for the development and implementation of operator support systems. This includes the experience with human-machine interfaces and closely related issues such as instrumentation and control, the use of computers in nuclear power plants, and operator qualification. (author).

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	20:17259	PNL-SA–25648
	20:17314	PNL-SA–24262
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AC06-87RL10930	**Westinghouse Hanford Co., Richland, WA (United States)**	
	20:14938	WHC-SA–2491
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	20:14941	WHC-SD-SNF-CSER–001-Rev.1
	20:14942	WHC-SD-SNF-DR–001
	20:14943	WHC-SD-SNF-SM–002
	20:14944	WHC-SD-SQA-CSA–20393
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	20:14946	WHC-SD-WM-PROC–019
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	20:15055	WHC-SA–2729
	20:15056	WHC-SD-CP-TP–083
	20:15057	WHC-SD-EN-AP–184
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	20:15063	WHC-SD-LEF-CSCM–001
	20:15064	WHC-SD-LEF-OTR–001
	20:15065	WHC-SD-LEF-QAPP–002
	20:15066	WHC-SD-LEF-TS–001-Rev.2
	20:15067	WHC-SD-SNF-DRP–001
	20:15068	WHC-SD-SNF-SD–002
	20:15069	WHC-SD-SNF-TP–009-Rev.1
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	20:15075	WHC-SD-W100-TD–001
	20:15076	WHC-SD-W112-CSER–001
	20:15077	WHC-SD-W151-ATP–002
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	20:15085	WHC-SD-WM-ATP–063-Rev.1
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	20:15092	WHC-SD-WM-CMD–003
	20:15093	WHC-SD-WM-DA–183
	20:15094	WHC-SD-WM-DP–079
	20:15095	WHC-SD-WM-DP–098
	20:15096	WHC-SD-WM-DP–099
	20:15097	WHC-SD-WM-DP–101
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	20:15100	WHC-SD-WM-ER–417
	20:15101	WHC-SD-WM-ER–431
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	20:15104	WHC-SD-WM-ETP–137
	20:15105	WHC-SD-WM-ETP–146
	20:15106	WHC-SD-WM-ETP–148
	20:15107	WHC-SD-WM-ISB–003
	20:15108	WHC-SD-WM-OTR–148
	20:15109	WHC-SD-WM-OTR–151
	20:15110	WHC-SD-WM-PLN–091
	20:15111	WHC-SD-WM-PROC–014
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	20:15113	WHC-SD-WM-QAPP–018-Rev.1
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	20:15115	WHC-SD-WM-RPT–118
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	20:15117	WHC-SD-WM-SDRR–001
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	20:15119	WHC-SD-WM-TP–259-Rev.1
	20:15120	WHC-SD-WM-TP–289
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	20:15122	WHC-SD-WM-TP–300
	20:15123	WHC-SD-WM-TP–308
	20:15124	WHC-SD-WM-TP–309
	20:15126	WHC-SD-WM-TP–330
	20:15127	WHC-SD-WM-WP–132-Rev.5
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	20:15192	WHC-SD-WM-AP–005-Rev.5
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	20:15196	WHC-SD-WM-TA–161
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	20:16282	WHC-SA–2804
	20:16283	WHC-SD-SQA-CSA–20390-Rev.1
	20:16284	WHC-SD-TP-OMM–002
	20:16285	WHC-SD-W059-FHA–001
	20:16517	WHC-SA–2809
	20:16567	WHC-SA–2755
	20:16568	WHC-SD-EN-AP–093
	20:16569	WHC-SD-EN-TP–032
	20:16570	WHC-SD-EN-WP–012
	20:17321	WHC-SD-GN-UM–30008-Rev.1
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	20:15078	WHC-SD-W236A-PLN–006-Rev.2
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AC06-93RL12367	**Department of Energy, Richland, WA (United States). Richland Operations Office**	
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	20:15173	DOE/RL–94-42
	20:15174	DOE/RL–94-53-Draft-A
	Bechtel Hanford, Inc., Richland, WA (United States)	
	20:15144	DOE/RL–94-59-Draft-A
AC07-76ID01570	**USDOE Idaho Operations Office, Idaho Falls, ID (United States)**	
	20:14966	DOE/EA–0906
	USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health	
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AC07-94ID13223	**Idaho National Engineering Lab., Idaho Falls, ID (United States)**	
	20:14984	EGG-WM–10962
	20:15771	INEL–94/00023
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	20:17349	INEL–94/0121
	EG and G Idaho, Inc., Idaho Falls, ID (United States)	
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	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
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	Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)	
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	20:14969	DOE/LLW–195
AC08-87NV10576	**Science Applications International Corp., Las Vegas, NV (United States)**	
	20:14983	DOE/YMSCO–002
AC08-90NV10845	**Nevada Univ., Las Vegas, NV (United States). Water Resources Center**	
	20:16525	DOE/NV/10845–46
AC08-92NV10972	**International Technology, Inc., Las Vegas, NV (United States)**	
	20:16524	DOE/NV–391

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AC08-93NV11265	Lawrence Livermore National Lab., CA (United States)	
	20:16515	UCRL-JC-118404
AC08-94NV11432	Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States)	
	20:14971	DOE/NV/11432-T5
	20:15142	DOE/NV/11432-167
	20:16490	DOE/NV/11432-173
	20:16666	DOE/NV/11432-163
AC09-89SR18035	Westinghouse Savannah River Co., Aiken, SC (United States)	
	20:14915	WSRC-MS-94-0605
	20:15045	SWE-SWB-95-0004
	20:15129	WSRC-MS-94-0604
	20:15220	WSRC-MS-94-0488
	20:15477	WSRC-MS-95-0008
	20:15901	WSRC-MS-94-0463
	20:16173	PATENTS-US-A8022579
	20:16286	WSRC-MS-94-0544
AC11-89PN38014	Westinghouse Electric Corp., West Mifflin, PA (United States)	
	20:16270	PATENTS-US-A8033473
AC11-93PN38195	Bettis Atomic Power Lab., West Mifflin, PA (United States)	
	20:16178	WAPD-T-3041
	20:16924	WAPD-T-3044
AC12-76SN00052	Knolls Atomic Power Lab., Schenectady, NY (United States)	
	20:15391	KAPL-4798
AC21-87MC24116	Coal Technology Corp., Bristol, VA (United States)	
	20:14717	DOE/MC/24116-4035
AC21-89MC25177	Gilbert/Commonwealth, Inc., Reading, PA (United States)	
	20:14719	DOE/MC/25177-3935
AC21-89MC26366	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering	
	20:14720	DOE/MC/26366-4006
AC21-90MC27226	ARCTECH, Inc., Chantilly, VA (United States)	
	20:14721	DOE/MC/27226-4039
AC21-92MC28138	ICF Resources, Inc., Fairfax, VA (United States)	
	20:15705	DOE/MC/28138-95/C0454
AC21-92MC29109	Engineering Computer Optecnomics, Inc., Annapolis, MD (United States)	
	20:16521	DOE/MC/29109-3958
AC21-92MC29118	Transducer Research, Inc., Naperville, IL (United States)	
	20:16522	DOE/MC/29118-95/C0428
AC21-92MC29246	Minnesota Univ., Minneapolis, MN (United States)	
	20:14722	DOE/MC/29246-3981
AC21-92MC29261	Energy Research Corp., Danbury, CT (United States)	
	20:14723	DOE/MC/29261-4020
AC21-93MC29257	Allison Engine Co., Indianapolis, IN (United States)	
	20:14774	DOE/MC/29257-4005
	20:15368	DOE/MC/29257-95/C0410
	20:15803	DOE/MC/29257-95/C0452
AC21-93MC30170	Manufacturing Sciences Corp., Oak Ridge, TN (United States)	
	20:14970	DOE/MC/30170-95/C0438
AC21-93MC30246	Solar Turbines, Inc., San Diego, CA (United States)	
	20:15369	DOE/MC/30246-3973
AC21-93MC30247	Westinghouse Electric Corp., Orlando, FL (United States). Power Generation Business Unit	
	20:15370	DOE/MC/30247-3999
AC21-94MC30012	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering	
	20:14724	DOE/MC/30012-4021
AC22-88PC88881	ICF Kaiser Engineers, Inc., Pittsburgh, PA (United States)	
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	20:14726	DOE/PC/88881-T25
AC22-89PC89757	Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry	
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AC22-89PC89881	Geo-Microbial Technologies, Inc., Ochelata, OK (United States)	
	20:14753	DOE/PC/89881-T12
	20:14754	DOE/PC/89881-T13
AC22-90BC14661	Texas Univ., Austin, TX (United States). Center for Petroleum and Geosystems Engineering	
	20:14816	DOE/BC-14661-10
AC22-90PC90155	Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States)	
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	20:14777	DOE/PC/90155-T8
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	20:14779	DOE/PC/90155-T10
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	20:14781	DOE/PC/90155-T12
	20:14782	DOE/PC/90155-T14
	20:14783	DOE/PC/90155-T15
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AC22-90PC90165	Energy and Environmental Research Corp., Irvine, CA (United States)	
	20:14786	DOE/PC/90165-T5
AC22-90PC90361	North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center	
	20:15374	DOE/PC/90361-T16
AC22-90PC90362	Dravo Lime Co., Pittsburgh, PA (United States)	
	20:14755	DOE/PC/90362-T1-Vol.1
AC22-91PC90018	Air Products and Chemicals, Inc., Allentown, PA (United States)	
	20:15265	DOE/PC/90018-T8
	20:15266	DOE/PC/90018-T9
	20:15267	DOE/PC/90018-T10
AC22-91PC90042	UOP, Inc., Des Plaines, IL (United States)	
	20:15268	DOE/PC/90042-T11
	20:15269	DOE/PC/90042-T12
	20:15270	DOE/PC/90042-T13
AC22-91PC90364	ADA Technologies, Inc., Englewood, CO (United States)	
	20:14756	DOE/PC/90364-T9
AC22-91PC91034	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	20:15271	DOE/PC/91034-T10
	20:15272	DOE/PC/91034-T11
AC22-91PC91040	Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research	
	20:14728	DOE/PC/91040-48
AC22-91PC91051	Amoco Oil Co., Naperville, IL (United States). Research and Development Dept.	
	20:14729	DOE/PC/91051-T8-Vol.2
AC22-91PC91055	Auburn Univ., AL (United States)	
	20:14730	DOE/PC/91055-T10
AC22-91PC91161	Vortec Corp., Collegeville, PA (United States)	
	20:15780	DOE/PC/91161-T10

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AC22-91PC91162	Coal Tech Corp., Merion Station, PA (United States)	
	20:15371	DOE/PC/91162–T12
AC22-92BC14831	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering	
	20:14817	DOE/BC/14831–13
	20:14818	DOE/BC/14831–14
AC22-92BC14882	University of Southern Mississippi, Hattiesburg, MS (United States). Dept. of Polymer Science	
	20:14821	DOE/BC/14882–11
AC22-92BC14886	Surtek, Inc., Golden, CO (United States)	
	20:14822	DOE/BC/14886–9
AC22-92MT92009	Resource Technology Corp., Laramie, WY (United States)	
	20:14865	DOE/MT/92009–10
AC22-92PC92108	Energy International Corp., Pittsburgh, PA (United States)	
	20:14714	CONF-940813–40
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AC22-92PC92110	Colorado School of Mines, Golden, CO (United States)	
	20:15273	DOE/PC/92110–T7
AC22-92PC92111	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	20:15274	DOE/PC/92111–T8
AC22-92PC92113	Worcester Polytechnic Inst., MA (United States)	
	20:15275	DOE/PC/92113–T6
AC22-92PC92122	Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering	
	20:14735	DOE/PC/92122–T8
AC22-92PC92208	USDOE Pittsburgh Energy Technology Center, PA (United States)	
	20:14710	DOE/PC/92208–T9
AC22-93BC14891	Colorado School of Mines, Golden, CO (United States). Dept. of Petroleum Engineering	
	20:14798	DOE/BC/14891–5
	20:14823	DOE/BC/14891–6
AC22-93BC14892	Michigan Technological Univ., Houghton, MI (United States)	
	20:14824	DOE/BC/14892–4
AC22-93BC14894	Tulsa Univ., OK (United States)	
	20:14799	DOE/BC/14894–6
AC22-93PC92120	Media and Process Technology, Inc., Pittsburgh, PA (United States)	
	20:14734	DOE/PC/92120–T7
AC22-93PC92147	Hydrocarbon Research, Inc., Princeton, NJ (United States)	
	20:14736	DOE/PC/92147–6
	20:14737	DOE/PC/92147–8
AC22-93PC92206	AMAX Research and Development, Inc., Golden, CO (United States)	
	20:14709	DOE/PC/92206–T8
AC22-94PC94055	Kentucky Univ., Lexington, KY (United States). Research Foundation	
	20:14740	DOE/PC/94055–T1
AC22-94PC94066	California Univ., Berkeley, CA (United States)	
	20:15276	DOE/PC/94066–T1
AC24-92OR21972	Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project	
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	20:14988	FEMP–2370
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	20:15176	FEMP–2367
	20:16530	FEMP–2384
	20:16581	FEMP/SUB–080
	Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)	
	20:15652	FEMP–2401
AC34-90DP62349	EG and G Rocky Flats, Inc., Golden, CO (United States)	
	20:15147	RFP–4935
	20:16485	CONF-950646–5
	USDOE Rocky Flats Office, Golden, CO (United States)	
	20:15183	RFP–4939
AC34-90RF62349	EG and G Rocky Flats, Inc., Golden, CO (United States)	
	20:15023	RFP–4927
	20:15024	RFP–4928
AC34-93RF00653	Enserch Environmental Corp., Richland, WA (United States)	
	20:16713	DOE/RF/00653–T1
AC35-89ER40486	Universities Research Association, Waxahachie, TX (United States)	
	20:16760	PATENTS-US–A8027063
AC36-83CH10093	Radiation Systems, Inc., Cleveland, TN (United States)	
	20:15298	NREL/TP–413-7702
	National Renewable Energy Lab., Golden, CO (United States)	
	20:15233	NREL/CP–450-4972
	20:15239	NREL/SP–420-5570-Rev.2
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	20:15289	DOE/GO–10095-082
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	20:15302	DOE/GO–10095-085
	20:15307	DOE/GO–10095-125
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	USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States)	
	20:15671	DOE/GO–10095-019
AI01-92PE10021	National Regulatory Research Inst., Columbus, OH (United States)	
	20:15665	NRRI–92-17
AI03-94ER61761	Colorado Univ., Boulder, CO (United States). Cooperative Inst. for Research in Environmental Sciences	
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AI05-90OR21921	Oak Ridge National Lab., TN (United States)	
	20:14962	CONF-941144–107
AI08-92NV10874	Geological Survey, Denver, CO (United States)	
	20:15149	USGS-OFR–94-451
BI79-88BP92818	Oregon Dept. of Fish and Wildlife, Portland, OR (United States)	
	20:15281	DOE/BP–92818-3

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BI79-91BP17758	Washington State Dept. of Wildlife, Olympia, WA (United States)	
	20:15280	DOE/BP–17758-2
FC02-94ER40818	Lawrence Livermore National Lab., CA (United States)	
	20:16778	UCRL-JC–118357
FC07-93ID13205	EG and G Idaho, Inc., Idaho Falls, ID (United States)	
	20:15837	EGG-M–94409
FC08-90NV10872	Nevada Univ., Las Vegas, NV (United States)	
	20:17410	DOE/NV/10872–T176
	Nevada Univ., Las Vegas, NV (United States). Information Science Research Inst.	
	20:17326	CONF-950226–33
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	Nevada Univ., Las Vegas, NV (United States). Heat Transfer Lab.	
	20:17328	CONF-950226–35
FC08-90NV10891	Nevada Univ., Reno, NV (United States)	
	20:15817	CONF-9304146–4
FC21-86MC10637	North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center	
	20:15367	DOE/MC/10637–3292
FC21-87MC24132	American Electric Power Service Corp., Columbus, OH (United States)	
	20:14772	DOE/MC/24132–4026
FC21-90MC25140	Southern Co. Services, Inc., Birmingham, AL (United States)	
	20:14718	DOE/MC/25140–4009
FC21-90MC27229	Thermochem, Inc., Columbia, MD (United States)	
	20:14773	DOE/MC/27229–4002
FC21-91MC28055	Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center	
	20:15729	DOE/MC/28055–95/C0447
FC21-91MC28060	Dravo Lime Co., Pittsburgh, PA (United States)	
	20:14750	DOE/MC/28060–95/C0443
	20:14751	DOE/MC/28060–95/C0445
FC21-92MC29467	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	20:17409	DOE/MC/29467–3986
	West Virginia Univ., Morgantown, WV (United States). Dept. of Civil and Environmental Engineering	
	20:16523	DOE/MC/29467–4036
FC21-93MC30251	Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research	
	20:14744	DOE/MC/30251–3975
FC21-94MC29244	West Virginia Univ., Morgantown, WV (United States)	
	20:14752	DOE/MC/29244–4038
FC22-90PC89663	CQ, Inc., Homer City, PA (United States)	
	20:14707	DOE/PC/89663–T15
FC22-91PC90547	Energy and Environmental Research Corp., Irvine, CA (United States)	
	20:14757	DOE/PC/90547–T17
FC22-92PC92521	Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States)	
	20:15375	DOE/PC/92521–T214
FC22-93BC14956	Oklahoma Univ., Norman, OK (United States)	
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FC22-93BC14958	Lomax Exploration Co., Denver, CO (United States)	
	20:14826	DOE/BC/14958–9
FC22-93BC14960	Texaco Exploration and Production, Inc., New Orleans, LA (United States)	
	20:14827	DOE/BC/14960–7
FC22-93BC14961	Columbia Univ., Palisades, NY (United States). Lamont-Doherty Earth Observatory	
	20:14828	DOE/BC/14961–6
FC22-94BC14982	Laguna Petroleum Corp., Midland, TX (United States)	
	20:14801	DOE/BC/14982–1
FC22-94BC14983	Michigan Technological Univ., Houghton, MI (United States)	
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FC22-94BC14984	Luff Exploration Co., Denver, CO (United States)	
	20:14832	DOE/BC/14984–2
FC22-94BC14990	Oxy USA, Inc., Welch, TX (United States)	
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FC22-94PC94116	Acurex Environmental Corp., Research Triangle Park, NC (United States)	
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FC36-86SF16305	Florida Solar Energy Center, Cape Canaveral, FL (United States)	
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FG01-93EP10050	East-West Center, Honolulu, HI (United States)	
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FG01-94CE15599	Materials Technologies of Virginia, Inc., Blacksburg, VA (United States)	
	20:15913	DOE/CE/15599–T2
FG01-94CE15601	American Sun Co., Blue Hill, ME (United States)	
	20:15312	DOE/CE/15601–T1
FG01-94CE15604	Foster-Pegg (Richard W.), West Chester, PA (United States)	
	20:15366	DOE/CE/15604–T2
FG01-94CE15612	Synfuels Engineering and Development, Inc., Arvada, CO (United States)	
	20:15250	DOE/CE/15612–T3
FG02-85CE40735	Wisconsin Univ., Madison, WI (United States). Dept. of Mechanical Engineering	
	20:15251	DOE/CE/40735–2
	20:15252	DOE/CE/40735–3
FG02-86ER60407	Brookhaven National Lab., Upton, NY (United States)	
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FG02-86ER60460	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	20:16608	DOE/ER/60460–T4
FG02-87ER13791	Arizona State Univ., Tempe, AZ (United States). Dept. of Chemistry and Biochemistry	
	20:15288	DOE/ER/13791–T2
FG02-87ER40370	Ohio Univ., Athens, OH (United States). Dept. of Physics and Astronomy	
	20:16876	DOE/ER/40370–7
FG02-87ER60526	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	20:16608	DOE/ER/60460–T4
FG02-90ER13034	Oregon State Univ., Corvallis, OR (United States). Dept. of Nuclear Engineering	
	20:16288	DOE/ER/13034–2
FG02-90ER14115	Arizona Univ., Tucson, AZ (United States). Dept. of Geosciences	
	20:15331	DOE/ER/14115–T1
FG02-90ER14135	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering Technology	
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FG02-90ER40560	Lawrence Livermore National Lab., CA (United States)	
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FG02-90EW00003	Maryland Univ., Baltimore, MD (United States)	
	20:14968	DOE/EW/00003-3
FG02-91CE23810	Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States)	
	20:15778	DOE/CE/23810-51B
FG02-91ER20044	Arizona Univ., Tucson, AZ (United States)	
	20:16601	DOE/ER/20044-T2
FG02-92ER54181	Oak Ridge National Lab., TN (United States)	
	20:17231	DOE/ER-0313/16
FG02-92ER75758	Minnesota Science Museum, St. Paul, MN (United States)	
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FG02-93ER20130	Wisconsin Univ., Madison, WI (United States)	
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FG02-93ER61704	American Coll. of Nuclear Physicians, Washington, DC (United States)	
	20:16609	DOE/ER/61704-1
FG02-93ER61721	International Inst. for Applied Systems Analysis, Laxenburg (Austria)	
	20:15650	DOE/ER/61721-1
FG02-94ER25195	State Univ. of New York, Stony Brook, NY (United States). Dept. of Applied Mathematics and Statistics	
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FG02-95ER40896	Brookhaven National Lab., Upton, NY (United States)	
	20:16779	BNL-61593
FG03-87ER52143	California Univ., Santa Barbara, CA (United States). Dept. of Chemical and Nuclear Engineering	
	20:17237	DOE/ER/52143-T3
FG03-91ER40674	Brookhaven National Lab., Upton, NY (United States)	
	20:16779	BNL-61593
FG03-91ER54115	Oak Ridge National Lab., TN (United States)	
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FG03-92ER54150	General Atomics, San Diego, CA (United States)	
	20:17165	GA-A-21793
FG04-94AL99286	Maine Metal Products Association, Portland, ME (United States)	
	20:15777	DOE/AL/99286-T5
FG05-80ET53088	Texas Univ., Austin, TX (United States)	
	20:16764	DOE/ET/53088-698
	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	20:16958	DOE/ET/53088-692
	20:17147	DOE/ET/53088-691
	20:17148	DOE/ET/53088-694
	20:17149	DOE/ET/53088-697
FG05-83OR21389	CONEG Policy Research Center, Inc., Washington, DC (United States)	
	20:15237	DOE/OR/21389-T12
FG05-85ER13412	Oklahoma Univ., Norman, OK (United States)	
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FG05-86ER40272	Florida Univ., Gainesville, FL (United States)	
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	Lawrence Livermore National Lab., CA (United States)	
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FG05-86ER45233	Rice Univ., Houston, TX (United States)	
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FG05-88ER13829	Texas A and M Univ., College Station, TX (United States). Dept. of Chemistry	
	20:16180	DOE/ER/13829-T1
FG05-88ER25054	Santa Fe Inst., NM (United States)	
	20:16597	DOE/ER/25054-T2
	20:16598	DOE/ER/25054-T3
FG05-88ER25063	Virginia Univ., Charlottesville, VA (United States). School of Engineering and Applied Science	
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FG05-88ER40445	Louisiana State Univ., Baton Rouge, LA (United States). Intermediate Energy Nuclear Physics Group	
	20:16397	DOE/ER/40445-46
FG05-88ER40481	Louisiana State Univ., Baton Rouge, LA (United States)	
	20:16763	DOE/ER/40481-T1
FG05-90ER60960	National Academy of Sciences - National Research Council, Washington, DC (United States)	
	20:16665	DOE/ER/60960-T1
FG05-91ER40633	Texas A and M Univ., College Station, TX (United States). Dept. of Physics	
	20:16780	DOE/ER/40633-3
FG05-91ER75633	Rural Enterprises, Inc., Durant, OK (United States)	
	20:15672	DOE/ER/75633-T3
FG05-92ER75788	Virginia Univ., Charlottesville, VA (United States). Dept. of Mechanical, Aerospace and Nuclear Engineering	
	20:15382	DOE/ER/75788-1
FG05-93ER40770	Oak Ridge National Lab., TN (United States)	
	20:16857	CONF-9410324-1
FG05-94ER40842	Puerto Rico Univ., Mayaguez (Puerto Rico)	
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FG06-89ER75522	Oak Ridge National Lab., TN (United States)	
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FG21-90MC27115	Colorado Univ., Boulder, CO (United States). Dept. of Chemical Engineering	
	20:15264	DOE/MC/27115-4010
FG22-90PC90094	Utah Univ., Salt Lake City, UT (United States). Dept. of Chemical Engineering	
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FG22-90PC90286	California Inst. of Tech., Pasadena, CA (United States)	
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FG22-90PC90296	Maryland Univ., Princess Anne, MD (United States). Dept. of Natural Sciences	
	20:14727	DOE/PC/90296-T10
FG22-90PC90297	Morgan State Univ., Baltimore, MD (United States). School of Engineering	
	20:17142	DOE/PC/90297-T11
	20:17143	DOE/PC/90297-T13
FG22-90PC90311	Utah Univ., Salt Lake City, UT (United States)	
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FG22-91MT91004	Louisiana State Univ., Baton Rouge, LA (United States). Center for Coastal, Energy, and Environmental Resources	
	20:14866	DOE/MT/91004-1
FG22-91PC91281	Auburn Univ., AL (United States)	
	20:14731	DOE/PC/91281-T13
FG22-91PC91287	Georgia Inst. of Tech., Atlanta, GA (United States). School of Chemical Engineering	
	20:14732	DOE/PC/91287-16

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FG22-91PC91291	Kentucky Univ., Lexington, KY (United States). Research Foundation	
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FG22-91PC91292	Grambling State Univ., LA (United States). Dept. of Chemistry	
	20:14788	DOE/PC/91292–T13
FG22-91PC91293	Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Chemical Engineering	
	20:14758	DOE/PC/91293–13
FG22-91PC91336	Cincinnati Univ., OH (United States). Dept. of Civil and Environmental Engineering	
	20:14759	DOE/PC/91336–T6
FG22-92BC14852	Stanford Univ., CA (United States)	
	20:14819	DOE/BC/14852–9
	Stanford Univ., CA (United States). Dept. of Petroleum Engineering	
	20:14820	DOE/BC/14852–11
FG22-92MT92020	North Carolina Agricultural and Technical State Univ., Greensboro, NC (United States). Dept. of Chemical Engineering	
	20:14845	DOE/MT/92020–9
FG22-92MT92021	Morgan State Univ., Baltimore, MD (United States). School of Engineering	
	20:14775	DOE/MT/92021–9
FG22-92PC92104	USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Technical Management	
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FG22-92PC92527	University of Southern California, Los Angeles, CA (United States). Dept. of Chemical Engineering	
	20:14746	DOE/PC/92527–T9
FG22-92PC92534	Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Chemical Engineering	
	20:14760	DOE/PC/92534–7
FG22-92PC92535	Northeastern Univ., Boston, MA (United States)	
	20:14761	DOE/PC/92535–T9
FG22-92PC92542	Lehigh Univ., Bethlehem, PA (United States). Energy Research Center	
	20:15836	DOE/PC/92542–T9
FG22-92PC92544	Brown Univ., Providence, RI (United States). Div. of Engineering	
	20:14747	DOE/PC/92544–10
FG22-92PC92548	Washington Univ., Seattle, WA (United States). Dept. of Mechanical Engineering	
	20:14762	DOE/PC/92548–T9
FG22-92PC92550	Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research	
	20:14711	DOE/PC/92550–9
FG22-93PC93205	Delaware Univ., Newark, DE (United States)	
	20:14738	DOE/PC/93205–T5
FG22-93PC93220	Cincinnati Univ., OH (United States). Dept. of Chemical Engineering	
	20:14739	DOE/PC/93220–T5
FG22-93PC93223	Pennsylvania State Univ., University Park, PA (United States)	
	20:14748	DOE/PC/93223–T4
FG22-94BC14970	Oklahoma Univ., Norman, OK (United States)	
	20:14829	DOE/BC/14970–2
	Oklahoma Univ., Norman, OK (United States). Center for Reservoir Characterization	
	20:14800	DOE/BC/14970–2-Rev.
FG22-94BC14977	New Mexico Petroleum Recovery Research Center, Socorro, NM (United States)	
	20:14830	DOE/BC/14977–3
FG22-94MT94003	Underground Injection Practices Council Research Foundation, Oklahoma City, OK (United States)	
	20:14835	DOE/MT/94003–2
FG22-94MT94006	Kentucky State Government, Frankfort, KY (United States)	
	20:14868	DOE/MT/94006–2
FG22-94PC94203	Arizona Univ., Tucson, AZ (United States). Dept. of Chemical Engineering	
	20:14789	DOE/PC/94203–T1
FG22-94PC94226	Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Dept. of Mining and Minerals Engineering	
	20:14749	DOE/PC/94226–T1
FG22-94PC94227	Massachusetts Inst. of Tech., Cambridge, MA (United States). Energy Lab.	
	20:15651	DOE/PC/94227–T2
FG36-86SF16306	Colorado State Univ., Fort Collins, CO (United States). Solar Energy Applications Lab.	
	20:15309	DOE/SF/16306–46
FG46-93R699305	Superkinetic, Inc., Albuquerque, NM (United States)	
	20:15748	DOE/R6/99305–T3
FG49-93CE15600	S-Cal Research Corp., San Rafael, CA (United States)	
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W-31109-ENG-38	Argonne National Lab., Idaho Falls, ID (United States)	
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	20:16052	ANL/ET/CP–83786
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	20:16454	ANL/ESD/TM–85

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	20:17215	DOE/ER–0313/16
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W-7405-ENG-36	**Argonne National Lab., IL (United States)**	
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	Los Alamos National Lab., NM (United States)	
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W-7405-ENG-48	**Ames Lab., IA (United States)**	
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CONF-940277–		(Atmospheric radiation measurement science team meeting; Charleston, SC (United States); 28 Feb - 3 mar 1994)			
	20:16482	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009951	PC-402
CONF-9403214–		(International lighting in controlled environments workshop; Madison, WI (United States); 27-30 Mar 1994)			
	20:15742	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008170	MF-402
CONF-9403219–		(Symposium on technology in laboratories; Toki (Japan); 23-24 Mar 1994)			
	20:17258	*See* NIFS-MEMO–14			
CONF-940326–		(ASME/JSME/JSES international solar energy conference; San Francisco, CA (United States); 27-30 Mar 1994)			
10	20:15306	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010270	MF-1300; MF-1600
CONF-9404162–		(1994 chemical analysis by laser interrogation of proliferation effluents (CALIOPE ITR) interim technical review; Livermore, CA (United States); 26-28 Apr 1994)			
19	20:16176	*See* UCRL-JC–118286			

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CONF-9404248–		(National Council on Radiation Protection and Measurement (NCRP) conference; Bethesda, MD (United States); 6 Apr 1994)			
1	20:16663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008784	MF-607
CONF-9404251–		(Federation of Americal Societies for Experimental Biology (FASEB) symposium; Anaheim, CA (United States); 24-28 Apr 1994)			
1	20:16602	*See* LBL–36333			
CONF-9404252–		(Conference on high speed computing; Gleneden Beach, OR (United States); 18-21 Apr 1994)			
	20:17372	*See* LA–12930-C			
CONF-9404253–		(Workshop on finite temperature QCD and Quark-Gluon transport theory; Wuhan (China); 18-21 Apr 1994)			
1	20:16782	*See* BNL–61547			
CONF-9405291–		(2. European conference on joining technology (Eurojoin-2); Florence (Italy); 16-18 May 1994)			
2	20:17239	*See* ENEA-RT-ERG-FUS–94-01			
CONF-9405301–		(5. international symposium on industrial uses of selenium and tellurium; Brussels (Belgium); 8-11 May 1994)			
1	20:15286	*See* BNL–61501			
CONF-9405306–		(Technical conference on reconstruction, recultivation and subsequent use of open-cast mining surfaces; Ruhland (Germany); 31 May 1994)			
	20:14765	*See* ETDE-DE–75			
CONF-9405308–		(9. ultra short phenomenon; Heidelberg (Germany); 2-5 May 1994)			
1	20:16336	*See* UCRL-JC–118408			
CONF-9405310–		(11. international conference on plasma surface interactions; Ibaraki-Ken (Japan); 23-27 May 1994)			
Exc.	20:17156	*See* ENEA-RT-ERG-FUS–94-19			
CONF-9405311–		(4. symposium on geology of the Amazon; Belem (Brazil); 28 May - 3 jun 1994)			
	20:16132	*See* INIS-BR–3493			
	20:16133	*See* INIS-BR–3494			
	20:16134	*See* INIS-BR–3496			
	20:16135	*See* INIS-BR–3497			
	20:16136	*See* INIS-BR–3498			
CONF-940552–		(10. topical conference on high-temperature plasma diagnostics; Rochester, NY (United States); 8-12 May 1994)			
35	20:17263	*See* SAND–94-0282C			
38	20:17184	*See* PPPL–3063			
CONF-940580–		(11. international conference on plasma surface interactions in controlled fusion devices; Mito (Japan); 23-27 May 1994)			
26	20:17164	*See* GA-A–21716			
CONF-940616–		(Electronic materials conference; Boulder, CO (United States); 22-24 Jun 1994)			
91	20:16825	*See* FNAL/C–94/383			
CONF-9406194–		(PANS 2: advanced pulsed neutron sources; Dubna (Russian Federation); 14-16 Jun 1994)			
	20:16348	*See* JINR-E–3-94-128			
CONF-9406270–		(21. EPS conference on controlled fusion and plasma physics; Montpellier (France); 27 Jun - 1 jul 1994)			
8	20:17241	*See* GA-A–21757			
CONF-9406279–		(5. international conference on hyperbolic problems; Stony Brook, NY (United States); Jun 1994)			
Absts.	20:17324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008173	MF-405
CONF-9406318–		(Energy forum '94 on the energy problems of Bulgaria; Varna (Bulgaria); 15-17 Jun 1994)			
	20:14793	*See* INIS-mf–14492			
	20:14794	*See* INIS-mf–14493			
	20:14903	*See* INIS-mf–14488			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
	20:14904	*See* INIS-mf–14500			
	20:15279	*See* INIS-mf–14496			
	20:15284	*See* INIS-mf–14487			
	20:15621	*See* INIS-mf–14486			
	20:15622	*See* INIS-mf–14490			
	20:15623	*See* INIS-mf–14494			
	20:15624	*See* INIS-mf–14495			
	20:15625	*See* INIS-mf–14497			
	20:15626	*See* INIS-mf–14498			
	20:15627	*See* INIS-mf–14499			
	20:15628	*See* INIS-mf–14502			
	20:15699	*See* INIS-mf–14501			
	20:15717	*See* INIS-mf–14491			
	20:16497	*See* INIS-mf–14489			
CONF-9406327–		(ROOMVENT '94: 4. international conference on air distribution in rooms; Cracow (Poland); 15-17 Jun 1994)			
1	20:15736	*See* AU-IBT-R–9407			
2	20:15737	*See* AU-IBT-R–9416			
3	20:15738	*See* AU-IBT-R–9417			
4	20:15739	*See* AU-IBT-R–9427			
CONF-940641–		(8. world ceramic congress; Florence (Italy); 29 Jun - 4 jul 1994)			
2	20:16121	*See* UCRL-JC–115700			
CONF-940707–		(14. international conference on atomic physics; Boulder, CO (United States); 31 Jul - 5 aug 1994)			
1	20:16941	*See* UCRL-JC–118297			
CONF-9407176–		(Minerals bioprocessing 2 conference; Snowbird, UT (United States); 10-15 Jul 1994)			
1	20:14713	*See* BNL–60543			
CONF-940722–		(27. international conference on high energy physics; Glasgow (United Kingdom); 21-27 Jul 1994)			
44	20:16398	*See* FNAL/C–94/150-E			
45	20:16810	*See* DOE/ER/40272–212			
CONF-940738–		(23. DOE/NRC nuclear air cleaning and treatment conference; Buffalo, NY (United States); 25-28 Jul 1994)			
11	20:16280	*See* UCRL-JC–115893			
CONF-940813–		(208. American Chemical Society national meeting; Washington, DC (United States); 21-26 Aug 1994)			
39	20:14743	*See* PNL-SA–24495			
40	20:14714	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009368	MF-108
CONF-940815–		(International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994)			
112	20:14961	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008846	MF-2020
CONF-9408213–		(Conference on physics from large gamma-ray detector arrays; Berkeley, CA (United States); 2-6 Aug 1994)			
1	20:16395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009614	MF-413
CONF-9408227–		(45. annual American Institute of Biological Sciences (AIBS) meeting; Knoxville, TN (United States); 7-11 Aug 1994)			
1	20:16592	*See* UCRL-JC–120466			
CONF-9408229–		(ONS '94: 11. international Offshore Northern Seas conference and exhibition; Stavanger (Norway); 23-26 Aug 1994)			
1	20:15663	*See* NEI-NO–494			
2	20:15664	*See* NEI-NO–495			
3	20:15692	*See* NEI-NO–496			
4	20:15693	*See* NEI-NO–497			
5	20:15694	*See* NEI-NO–498			
6	20:14853	*See* NEI-NO–499			
7	20:16311	*See* NEI-NO–500			
8	20:16312	*See* NEI-NO–501			
9	20:15706	*See* NEI-NO–502			
10	20:16313	*See* NEI-NO–503			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
11	20:14905	*See* NEI-NO–504			
12	20:15376	*See* NEI-NO–505			
13	20:15377	*See* NEI-NO–506			
14	20:14808	*See* NEI-NO–507			
15	20:14809	*See* NEI-NO–508			
16	20:14810	*See* NEI-NO–509			
17	20:14811	*See* NEI-NO–510			
18	20:14812	*See* NEI-NO–511			
19	20:14813	*See* NEI-NO–512			
20	20:14854	*See* NEI-NO–513			
21	20:14855	*See* NEI-NO–514			
22	20:14856	*See* NEI-NO–515			
23	20:14857	*See* NEI-NO–516			
24	20:14858	*See* NEI-NO–517			
25	20:14814	*See* NEI-NO–518			
26	20:14859	*See* NEI-NO–519			
27	20:16314	*See* NEI-NO–520			
28	20:16315	*See* NEI-NO–521			
29	20:14860	*See* NEI-NO–522			
30	20:14861	*See* NEI-NO–523			
31	20:16316	*See* NEI-NO–524			
32	20:16317	*See* NEI-NO–525			
33	20:16318	*See* NEI-NO–526			
34	20:16319	*See* NEI-NO–527			
35	20:16320	*See* NEI-NO–528			
36	20:16321	*See* NEI-NO–529			
37	20:16322	*See* NEI-NO–530			
38	20:14862	*See* NEI-NO–531			
39	20:14863	*See* NEI-NO–532			
40	20:14864	*See* NEI-NO–533			
41	20:16323	*See* NEI-NO–534			
42	20:16324	*See* NEI-NO–535			
43	20:16325	*See* NEI-NO–536			
44	20:14836	*See* NEI-NO–537			
45	20:14837	*See* NEI-NO–538			
46	20:14838	*See* NEI-NO–539			
47	20:14839	*See* NEI-NO–540			
48	20:16442	*See* NEI-NO–541			
49	20:14840	*See* NEI-NO–542			
50	20:16443	*See* NEI-NO–543			
51	20:16326	*See* NEI-NO–544			
52	20:16327	*See* NEI-NO–545			
53	20:16328	*See* NEI-NO–546			
54	20:16266	*See* NEI-NO–547			
55	20:16444	*See* NEI-NO–548			
56	20:15685	*See* NEI-NO–549			
57	20:16267	*See* NEI-NO–550			
58	20:16268	*See* NEI-NO–551			
59	20:14877	*See* NEI-NO–552			
60	20:14846	*See* NEI-NO–553			
61	20:14847	*See* NEI-NO–554			
62	20:14848	*See* NEI-NO–555			
63	20:14849	*See* NEI-NO–556			
64	20:14841	*See* NEI-NO–557			
65	20:14842	*See* NEI-NO–558			
66	20:14843	*See* NEI-NO–559			
67	20:14844	*See* NEI-NO–560			
CONF-9408230–		(International symposium on waves - physical and numerical modelling; Vancouver (Canada); 21-24 Aug 1994)			
1	20:16304	*See* NEI-DK–1888			
CONF-9408232–		(Conference on the structure and model of the first cell. The Alexander Ivanovich Oparin 100th Anniversary Conference; Trieste (Italy); 29 Aug - 2 sep 1994)			
	20:16603	*See* IC–94/234			
CONF-940830–		(13. international conference on thermoelectrics; Kansas City, MO (United States); 30 Aug - 1 sep 1994)			
3	20:15727	*See* IS-M–811			
4	20:15726	*See* IS-M–810			

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CONF-940843–		(18. European symposium on fusion technology; Karlsruhe (Germany); 22-26 Aug 1994)			
18	20:17242	*See* GA-A–21814			
CONF-9409144–		(4. international symposium on ventilation for contaminant control: from research to practice - from practice to research; Stockholm (Sweden); 5-9 Sep 1994)			
1	20:15741	*See* AU-IBT-R–9446			
CONF-9409150–		(CAM '94: Canadian-American-Mexican physics meeting; Cancun (Mexico); 26-30 Sep 1994)			
1	20:16875	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010279	MF-413
CONF-940920–		(13. international symposium on chemical reaction engineering; Baltimore, MD (United States); 25 Sep 1994)			
	20:14911	*See* CEA-CONF–11920			
CONF-940922–		(7. international conference on physics of highly charged ions; Vienna (Austria); 19-23 Sep 1994)			
5	20:16762	*See* UCRL-JC–117182			
6	20:16950	*See* UCRL-JC–118364			
7	20:16949	*See* UCRL-JC–118363			
CONF-9409264–		(Low-energy antiproton physics; Bled (Slovenia); 12-17 Sep 1994)			
2	20:16956	*See* LA-UR–95-728			
CONF-9409278–		(GVIS '94: graphics and visualization conference; Richland, WA (United States); 8 Sep 1994)			
4	20:17382	*See* PNL-SA–24897			
CONF-940930–		(11. annual international Pittsburgh coal conference: coal, energy and the environment; Pittsburgh, PA (United States); 12-16 Sep 1994)			
8	20:14715	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009369	MF-108
CONF-9409304–		(Workshop on transport for a common ion driver; Albuquerque, NM (United States); 20-21 Sep 1994)			
	20:17264	*See* SAND–95-0116			
CONF-9409318–		(Specialists' Meeting on Advanced Information Methods and Artificial Intelligence in Nuclear Power Plant Control Rooms; Halden (Norway); 13-15 Sep 1994)			
	20:15482	*See* IAEA–12-SP-384.37			
CONF-9409320–		(Joint Society of American Foresters/Canadian Institute of Forestry national convention on physiology; Anchorage, AK (United States); 18-22 Sep 1994)			
1	20:16703	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009132	MF-402
CONF-9409321–		(Fontevraud 3; Chinon (France); 12-16 Sep 1994)			
1	20:15391	*See* KAPL–4798			
CONF-9409326–		(International Energy Agency Energy Technology systems analysis program workshop; Banff (Canada); 2-9 Sep 1994)			
1	20:15697	*See* BNL–61556			
CONF-9409327–		(International workshop on advanced materials for high precision detectors; Archamps Haute Savoie (France); 28-30 Sep 1994)			
	20:16393	*See* CERN–94-07			
CONF-9409328–		(Annual meeting of the North American Association for Environmental Education; Cancun (Mexico); 23-27 Sep 1994)			
1	20:15635	*See* ANL/EA/CP–85788			
CONF-940933–		(15. international conference on plasma physics and controlled nuclear fusion research; Madrid (Spain); 26 Sep - 1 oct 1994)			
36	20:17165	*See* GA-A–21793			

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CONF-9409333–		(IAEA specialists' meeting on comparison of activation cross section measurement and experimental techniques for fusion reactor technology; St. Petersburg (Russian Federation); 7-9 Sep 1994)			
	20:17246	*See* INDC(NDS)–319			
CONF-940951–		(International conference on low-temperature physics; Dubna (Russian Federation); 6-9 Sep 1994)			
	20:16018	*See* JINR-D–14-94-269(v.2)			
CONF-941010–		(4. international conference on nuclear microprobe technology and applications; Shanghai (China); 10-14 Oct 1994)			
	20:16998	*See* CEA-CONF–11875			
CONF-941013–		(Applied superconductivity conference; Boston, MA (United States); 16-21 Oct 1994)			
32	20:17024	*See* ANL/ET/CP–84477			
33	20:17266	*See* UCRL-JC–116966			
34	20:15920	*See* IS-M–814			
35	20:16453	*See* UCRL-JC–119292			
CONF-9410165–		(Neutron scattering; Sendai (Japan); 11-14 Oct 1994)			
13	20:16963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006626	MF-413
CONF-9410207–		(Symposium on applications of inductively coupled plasma mass spectrometry (ICP-MS) to radionuclide determinations; Gatlinburg, TN (United States); 11-13 Oct 1994)			
2	20:16530	*See* FEMP–2384			
CONF-9410212–		(Cray user's group conference; Tours (France); 10-14 Oct 1994)			
4	20:16564	*See* UCRL-JC–118635			
CONF-9410218–		(Pulsed radio frequency sources for linear colliders; Long Island, NY (United States); 2-7 Oct 1994)			
9	20:16388	*See* SLAC-PUB–95-6755			
CONF-941022–		(5. international conference on stability and handling of liquid fuels; Rotterdam (Netherlands); 3-7 Oct 1994)			
Vol.2	20:14876	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009411	PC-125
CONF-9410238–		(International Energy Agency symposium on the use of superconductivity in energy storage; Karlsruhe (Germany); 25-27 Oct 1994)			
2	20:15629	*See* ANL/ET/CP–84445			
CONF-9410246–		(7. annual meeting of the Advanced Light Source Users Association; Berkeley, CA (United States); 20-21 Oct 1994)			
	20:16354	*See* LBL–36500			
CONF-9410256–		(Society of Automotive Engineers' convergence '94; Detroit, MI (United States); 18-27 Oct 1994)			
4	20:15810	*See* ANL/ET/CP–85237			
5	20:15808	*See* ANL/ES/CP–85703			
CONF-9410283–		(17. international Taniguchi symposium on theoretical physics on spectroscopy of Mott Insulators and Correlated Metals; Shima (Japan); 24-29 Oct 1994)			
1	20:15919	*See* IS-M–812			
CONF-9410290–		(36. mechanical working and steel processing conference; Baltimore, MD (United States); Oct 1994)			
4	20:15837	*See* EGG-M–94409			
CONF-9410294–		(1994 symposium of the North Eastern Accelerator personnel (SNEAP-94); Kalamazoo, MI (United States); 12-15 Oct 1994)			
4	20:16343	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009128	MF-413
CONF-9410309–		(Contractor's coordination meeting; Dearborn, MI (United States); 24-27 Oct 1994)			
2	20:15809	*See* ANL/ES/CP–85704			

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CONF-9410324–		(International workshop on structure and dynamics of quantum many-body systems; Aizn (Japan); 19-21 Oct 1994)			
1	20:16857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008783	MF-413
CONF-9410327–		(International symposium o ecosystem manipulation; Bowness-on-Windermere (United Kingdom); 19-21 Oct 1994)			
1	20:16483	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008677	MF-402
CONF-9410330–		(Encontro sobre escoamento em meios porosos; Floriaopolis (Brazil); 19-21 Oct 1994)			
1	20:16255	*See* UCRL-JC–119485			
CONF-9410331–		(ISATA international conference on new and alternative materials for the transportation industries; Aachen (Germany); 31 Oct - 4 nov 1994)			
1	20:16298	*See* UCRL-JC–118767			
CONF-9410338–		(Environmental Radioactivity: national seminar with international participation; Sofia (Bulgaria); 11-13 Oct 1994)			
	20:16148	*See* INIS-mf–14528			
	20:16546	*See* INIS-mf–14524			
	20:16547	*See* INIS-mf–14525			
	20:16548	*See* INIS-mf–14527			
	20:16672	*See* INIS-mf–14526			
CONF-9410339–		(Research co-ordination meeting on operator support systems in nuclear power plants; Rome (Italy); 10-14 Oct 1994)			
	20:15548	*See* IAEA-IWG-NPPCI–95/1			
CONF-9410340–		(5. expert meeting in special topic presentation at forum; Leamington Spa (United Kingdom); 25-29 Oct 1994)			
1	20:15735	*See* AUC-IBT-R–9454			
CONF-9410342–		(1. research co-ordination meeting on establishment of an international reference data library of nuclear activation cross sections; Debrecen (Hungary); 4-7 Oct 1994)			
	20:17432	*See* INDC(NDS)–320			
CONF-941050–		(EWEC'94: 5. European Wind Energy Association conference and exhibition; Thessaloniki (Greece); 10-14 Oct 1994)			
	20:15350	*See* RISO-R–797(EN)			
CONF-941060–		(4. international conference on advanced technology and particle physics; Como (Italy); 3-7 Oct 1994)			
5	20:16399	*See* FNAL/C–95/01-E			
CONF-941061–		(Nuclear science symposium: medical imaging conference; Norfolk, VA (United States); 30 Oct - 5 nov 1994)			
18	20:16435	*See* UCRL-JC–117142			
19	20:16434	*See* UCRL-JC–117141			
CONF-941074–		(21. water reactor safety information meeting; Washington, DC (United States); 25-27 Oct 1994)			
2	20:15608	*See* SAND–95-0561C			
CONF-941101–		(Meeting of the Division of Plasma Physics of the American Physical Society; Minneapolis, MN (United States); 7-11 Nov 1994)			
9	20:17166	*See* GA-A–21914			
10	20:17267	*See* UCRL-JC–119070			
CONF-941102–		(Winter meeting of the American Nuclear Society; Washington, DC (United States); 13-18 Nov 1994)			
3	20:15000	*See* LA-UR–94-2018			
41	20:14948	*See* ANL/CMT/CP–83588			
42	20:16517	*See* WHC-SA–2809			
43	20:15019	*See* PNL-SA–24451			
44	20:15055	*See* WHC-SA–2729			

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CONF-9411104–		(Institute of Electrical and Electronics Engineers (IEEE) international conference on image processing; Austin, TX (United States); 13-16 Nov 1994)			
3	20:17401	*See* UCRL-JC–116695			
CONF-9411145–		(IAEA conference on improvement of measurements, theoretical computations, and evaluations of neutron-induced helium production cross sections; Beijing (China); 1-4 Nov 1994)			
	20:16886	*See* INDC(NDS)–323			
CONF-9411149–		(Opportunity 95: environmental technology through small business; Morgantown, WV (United States); 16-17 Nov 1994)			
25	20:14970	*See* DOE/MC/30170–95/C0438			
27	20:16522	*See* DOE/MC/29118–95/C0428			
CONF-9411155–		(1994 Luxembourg international symposium on the rehabilitation of military sites and demilitarization of explosive ordance; Kirchberg (Luxembourg); 14-18 Nov 1994)			
2	20:16711	*See* UCRL-JC–119715			
3	20:16563	*See* UCRL-JC–115974			
CONF-9411207–		(Advanced turbine systems annual program review; Arlington, VA (United States); 9-11 Nov 1994)			
1	20:16299	*See* DOE/METC/C–95/7176			
CONF-9411210–		(2. workshop on physics potential and development of mu+ mu- colliders; Sausalito, CA (United States); 17-19 Nov 1994)			
1	20:16400	*See* FNAL/C–95/037			
2	20:16779	*See* BNL–61593			
3	20:16373	*See* BNL–61581			
CONF-9411212–		(Energy and national security in the 21st century conference; Washington, DC (United States); 10 Nov 1994)			
1	20:15696	*See* PNL-SA–25138			
CONF-9411219–		(8. Symposium on aerodynamics of wind turbines; Lyngby (Denmark); 21-22 Nov 1994)			
	20:15347	*See* NEI-DK–1971			
CONF-941124–		(33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies; Richland, WA (United States); 7-11 Nov 1994)			
21	20:16296	*See* PNL-SA–24388			
22	20:16589	*See* PNL-SA–24505			
CONF-941129–		(13. international conference on the application of accelerators in research and industry; Denton, TX (United States); 7-10 Nov 1994)			
21	20:16947	*See* PNL-SA–24529			
22	20:16436	*See* UCRL-JC–118444			
CONF-941144–		(1994 fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 28 Nov - 2 dec 1994)			
104	20:16057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009131	MF-404
105	20:16058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008901	MF-411; MF-404
106	20:16295	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008839	MF-404
107	20:14962	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008840	MF-2020
108	20:15818	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009125	MF-404
109	20:15819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009129	MF-404
114	20:15581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008841	MF-414
115	20:16059	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008843	MF-1406
116	20:15908	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009073	MF-404
117	20:15820	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009179	MF-404
118	20:15821	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009178	MF-1505
119	20:16060	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009173	MF-404
120	20:15053	*See* WHC-SA–2675			

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121	20:16048	*See* SAND–95-0567C			
122	20:15054	*See* WHC-SA–2676			
123	20:16085	*See* IS-M–815			
124	20:15921	*See* IS-M–816			
125	20:15822	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010281	MF-404
133	20:15909	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010278	MF-404
CONF-941182–		(6. international Toki conference on plasma physics and controlled nuclear fusion: Research for advanced concepts in magnetic fusion; Toki-city (Japan); 29 Nov - 2 dec 1994)			
3	20:17167	*See* GA-A–21926			
CONF-941207–		(Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994)			
31	20:14950	*See* ANL/CMT/CP–84354			
32	20:15452	*See* ANL/IFR/CP–83257			
33	20:14949	*See* ANL/CMT/CP–83895			
34	20:14917	*See* ANL/TD/CP–84441			
35	20:16256	*See* ANL/RA/CP–84371			
36	20:14916	*See* ANL/FO/CP–84381			
CONF-941210–		(Power generation conference; Orlando, FL (United States); 7-9 Dec 1994)			
11	20:14908	*See* ANL/ES/CP–85388			
13	20:15240	*See* ANL/ES/CP–85392			
CONF-941214–		(16. US Department of Energy low-level radioactive waste management conference; Phoenix, AZ (United States); 13-15 Dec 1994)			
5	20:14985	*See* FEMP–2344			
6	20:14993	*See* INEL–94/00052			
7	20:16248	*See* INEL–94/00051			
CONF-941216–		(33. Institute of Electrical and Electronic Engineers (IEEE) conference on decision and control; Orlando, FL (United States); 14-16 Dec 1994)			
3	20:15481	*See* ANL/IFR/CP–83965			
CONF-941221–		(12. International electric vehicle symposium; Anaheim, CA (United States); 5-7 Dec 1994)			
3	20:15631	*See* ANL/CMT/CP–83389			
CONF-941241–		(Critial assessment of techniques for protein structure prediction; Asilomar, CA (United States); 4-8 Dec 1994)			
Absts.	20:16599	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009628	MF-908
CONF-941255–		(Life cycles of energetic materials; Del Mar, CA (United States); 11-16 Dec 1994)			
2	20:16462	*See* LA-UR–95-1107			
3	20:16461	*See* LA-UR–95-1074			
CONF-941266–		(African conference on policy options and responses to climate change; Nairobi (Kenya); 5-8 Dec 1994)			
	20:15700	*See* NEI-SE–198			
CONF-941267–		(4. Material Research Society-Ferroelectric thin films conference; Boston, MA (United States); 5-9 Dec 1994)			
1	20:16049	*See* SAND–95-0735C			
CONF-941269–		(International conference on lasers '94; Quebec (Canada); 12-16 Dec 1994)			
1	20:16529	*See* ETDE-IT–95-15			
CONF-950106–		(11. international symposium on use and management of coal combustion by-products (CCBs); Orlando, FL (United States); 15-19 Jan 1995)			
1	20:14750	*See* DOE/MC/28060–95/C0443			
2	20:14751	*See* DOE/MC/28060–95/C0445			
CONF-950110–		(12. symposium on space nuclear power and propulsion; Albuquerque, NM (United States); 8-12 Jan 1995)			
18	20:15771	*See* INEL–94/00023			
20	20:15728	*See* IS-M–813			

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CONF-950127–		(11. international conference on ultra-relativistic nucleus-nucleus collisions; Monterey, CA (United States); 9-13 Jan 1995)			
1	20:16921	*See* LA-UR–95-1020			
2	20:16809	*See* BNL–61549			
CONF-950129–		(19. annual conference on advanced ceramics, materials and structures; Cocoa Beach, FL (United States); 9-12 Jan 1995)			
3	20:16061	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009172	MF-1505
4	20:15910	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009177	MF-1400
5	20:16052	*See* ANL/ET/CP–83786			
6	20:15911	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010282	MF-1502
CONF-950151–		(NATO (ASI)/monitoring a comprehensive test ban treaty; Algrave (Portugal); 23 Jan - 2 feb 1995)			
4	20:16475	*See* PNL-SA–25481			
CONF-950153–		(4. conference on polar meteorology and oceanography; Dallas, TX (United States); 15-20 Jan 1995)			
3	20:16508	*See* SAND–95-0571C			
CONF-950158–		(International forum process analytical chemistry (IFPAC); Houston, TX (United States); 22-25 Jan 1995)			
2	20:16161	*See* LA-UR–95-966			
CONF-950163–		(3. international on-site analysis conference; Houston, TX (United States); 22-25 Jan 1995)			
3	20:16479	*See* UCRL-JC–118760			
CONF-950165–		(DNP/NSAC town meeting on nuclear physics with intermediate energy and high-energy hadron probes; Chicago, IL (United States); 29-30 Jan 1995)			
2	20:16878	*See* FNAL/C–95/018			
CONF-950170–		(DOE/EPRI workshop on the physics of spherical continuous inertial fusion; Santa Fe, NM (United States); 12-14 Jan 1995)			
2	20:17268	*See* UCRL-JC–119584			
CONF-950173–		(Quark matter '95; Monterey, CA (United States); 9-13 Jan 1995)			
2	20:16920	*See* LA-UR–95-834			
CONF-950178–		(24. water for Texas conference; Austin, TX (United States); 25-26 Jan 1995)			
1	20:16556	*See* SAND–95-0318C			
CONF-950180–		(10. winter workshop on nuclear dynamics; Snowbird, UT (United States); 15-21 Jan 1995)			
1	20:16873	*See* BNL–61514			
CONF-950181–		(Information and telecommunications technology for the U.S. utilities industry; Atlanta, GA (United States); 30-31 Jan 1995)			
1	20:17325	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009075	MF-405
CONF-950182–		(2. Defense Nuclear Agency/Arms Control and Disarmanent Agency (DNA/ACDA) veritech symposium; Washington, DC (United States); 10-12 Jan 1995)			
1	20:16477	*See* UCRL-JC–119103			
2	20:16476	*See* UCRL-JC–119102			
CONF-950184–		(ISWA's international conference on recycling; Taipei (China); 12 Jan 1995)			
1	20:15801	*See* NEI-DK–1974			
CONF-950201–		(Annual meeting and exhibition of the Minerals, Metals and Materials Society (TMS); Las Vegas, NV (United States); 12-16 Feb 1995)			
9	20:16112	*See* LA-UR–95-654			
10	20:15899	*See* UCRL-JC–119682			
11	20:15898	*See* UCRL-JC–119681			
12	20:15816	*See* ANL/MSD/CP–84769			
13	20:15891	*See* PNL-SA–26013			

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CONF-950209–		(4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995)			
4	20:16555	*See* PNL-SA–24663			
CONF-950216–		(Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995)			
100	20:14953	*See* ANL/EA/CP–85594			
101	20:14954	*See* ANL/EA/CP–85596			
102	20:14952	*See* ANL/EA/CP–84165			
103	20:14951	*See* ANL/EA/CP–84147			
104	20:15161	*See* ANL/EA/CP–84160			
105	20:16519	*See* BNL–61426			
106	20:15164	*See* ANL/EA/CP–84360			
107	20:15162	*See* ANL/EA/CP–84163			
108	20:14955	*See* ANL/TD/CP–84268			
109	20:15160	*See* ANL/EA/CP–84148			
110	20:15645	*See* ANL/EA/CP–84258			
111-Rev.1	20:15049	*See* UCRL-JC–118741-Rev.1			
112	20:16282	*See* WHC-SA–2804			
113	20:16679	*See* LA-UR–95-175			
114	20:16456	*See* LA-UR–95-176			
115	20:16123	*See* ANL/ER/CP–84530			
116	20:15182	*See* PNL-SA–25864			
117	20:15022	*See* PNL-SA–25649			
118	20:15045	*See* SWE-SWB–95-0004			
119	20:14919	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010285	MF-2000
120	20:15646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010284	MF-2000
78	20:15033	*See* SAND–95-0437C			
83	20:15181	*See* PNL-SA–25063			
86	20:15020	*See* PNL-SA–24936			
90	20:14986	*See* FEMP–2356			
91	20:15175	*See* FEMP–2359			
92	20:14987	*See* FEMP–2366			
93	20:14995	*See* KCP–613-5532			
94	20:15176	*See* FEMP–2367			
95	20:14963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009174	MF-2030
96	20:14988	*See* FEMP–2370			
98	20:15165	*See* ANL/EA/CP–85502			
99	20:15163	*See* ANL/EA/CP–84167			
CONF-950220–		(9. international conference on ion beam modification of materials; Canberra (Australia); 5-10 Feb 1995)			
5	20:16612	*See* SAND–95-0672C			
CONF-950226–		(SPIE '95: SPIE conference on optics, electro-optics, and laser application in science, engineering and medicine; San Jose, CA (United States); 5-10 Feb 1995)			
20	20:16332	*See* SAND–94-0252C			
21	20:16271	*See* SAND–94-2270C			
30	20:16600	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009032	MF-408
31	20:16333	*See* SAND–94-2169C			
32	20:16606	*See* UCRL-JC–117560			
33	20:17326	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009885	MF-800
34	20:17327	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009887	MF-800
35	20:17328	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009886	MF-800
36	20:16128	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010283	MF-401
CONF-950228–		(North American conference on smart structures and materials; San Diego, CA (United States); 26 Feb - 3 mar 1995)			
5	20:15797	*See* SAND–95-0609C			
CONF-950232–		(6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995)			
30	20:17197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006392	MF-420
31	20:14964	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006391	MF-2060

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CONF-950241–		(5. international symposium on chemical oxidation; Nashville, TN (United States); 15-17 Feb 1995)			
3	20:15775	*See* ANL/CHM/CP–84094			
CONF-950282–		(3. international symposium on productivity and quality improvement conference; Vienna, VA (United States); 27 Feb - 1 mar 1995)			
2	20:17315	*See* PNL-SA–25327			
3	20:17314	*See* PNL-SA–24262			
CONF-950283–		(Application of vortex methods to engineering problems forum; Albuquerque, NM (United States); 22-24 Feb 1995)			
1	20:16292	*See* SAND–94-1735C			
2	20:16293	*See* SAND–95-0278C			
CONF-950284–		(1. international workshop on supercritical water oxidation; Jackson, FL (United States); 6-9 Feb 1995)			
2	20:15655	*See* LA-UR–95-187			
CONF-950285–		(LAFEX international school in high energy physics; Rio de Janeiro (Brazil); 20 Feb 1995)			
1	20:16826	*See* FNAL/C–95/041			
CONF-950304–		(Corrosion '95: National Association of Corrosion Engineers (NACE) international annual conference and corrosion show; Orlando, FL (United States); 26-31 Mar 1995)			
14	20:15890	*See* PNL-SA–25506			
CONF-950309–		(25. annual conference and exhibition on wind power; Washington, DC (United States); 26-30 Mar 1995)			
1	20:15613	*See* NREL/TP–441-7807			
2	20:15348	*See* NREL/TP–441-7805			
CONF-9503102–		(Waste management symposia; Tucson, AZ (United States); 1 Mar 1995)			
2	20:15001	*See* LA-UR–95-90			
CONF-9503111–		(Toward an electronic patient record '95; Orlando, FL (United States); 14-19 Mar 1995)			
1	20:17436	*See* SAND–95-0305C			
CONF-9503112–		(Agile Manufacturing conference (AMC '95); Albuquerque, NM (United States); 16-17 Mar 1995)			
1	20:16458	*See* SAND–95-0438C			
2	20:17387	*See* SAND–95-0492C			
CONF-9503113–		(Automotive laser applications workshop; Dearborn, MI (United States); 6-7 Mar 1995)			
1	20:15893	*See* SAND–95-0380C			
CONF-9503115–		(International symposium on advanced synthesis and processing; College Station, TX (United States); 11-15 Mar 1995)			
1	20:16047	*See* SAND–95-0322C			
CONF-9503116–		(1995 TOUGH workshop; Berkeley, CA (United States); 20-22 Mar 1995)			
1	20:15032	*See* SAND–95-0324C			
2	20:16558	*See* SAND–95-0584C			
3	20:15037	*See* SAND–95-0568C			
4	20:15038	*See* SAND–95-0587C			
5	20:15035	*See* SAND–95-0564C			
6	20:15036	*See* SAND–95-0565C			
CONF-9503118–		(Clean steel-supper clean steel conference; London (United Kingdom); 6-7 Mar 1995)			
1	20:17259	*See* PNL-SA–25648			
CONF-9503119–		(Waste management '95; ECM '95 conference; Tucson, AZ (United States); Las Cruces, NM (United States); 26 Feb - 2 mar 1995; 12-15 mar 1995)			
1	20:14995	*See* KCP–613-5532			
2	20:16335	*See* SAND–95-0573C			
3	20:15666	*See* SAND–95-0563C			
CONF-9503120–		(Instructions for the Hazardous Materials Resources Institute conference; Atlanta, GA (United States); 14-15 Mar 1995)			
1	20:16520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009026	MF-2010

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CONF-9503122–		(27. ACM annual symposium on theory of computing (STOC); Livermore, CA (United States); Mar 1995)			
1	20:17375	*See* LA-UR–95-20			
CONF-9503123–		(Maes national symposium and career fair; Los Angeles, CA (United States); 26-29 Mar 1995)			
1	20:16192	*See* LA-UR–95-795			
CONF-9503124–		(Workshop on macroscopic quantum phenomena and coherence in superconducting networks; Frascati (France); 1-5 Mar 1995)			
1	20:17118	*See* LA-UR–95-967			
CONF-9503125–		(9. international conference on microscopy of semiconducting materials; Oxford (United Kingdom); 20-23 Mar 1995)			
1	20:16114	*See* SAND–94-3247C			
CONF-9503127–		(9. US/Japan workshop on high-field superconducting materials; Kyoto (Japan); 11-16 Mar 1995)			
1	20:17025	*See* BNL–61242			
2	20:17269	*See* UCRL-JC–120076			
CONF-9503128–		(1. international plant operations and design conference; Houston, TX (United States); 21-23 Mar 1995)			
1	20:15021	*See* PNL-SA–25590			
CONF-9503129–		(Cray User Group spring conference; Denver, CO (United States); 15 Mar 1995)			
1	20:17437	*See* SAND–95-0661C			
CONF-950350–		(10. intersociety cryogenic symposium; Houston, TX (United States); 19-23 Mar 1995)			
1	20:16374	*See* FNAL/C–95/039			
CONF-950356–		(Stanford conference on spectroscopies in novel superconductors; Stanford, CA (United States); 15-18 Mar 1995)			
1	20:16044	*See* LA-UR–95-972			
CONF-950381–		(11. symposium on boundary layers and turbulence; Charlotte, NC (United States); 27-31 Mar 1995)			
1	20:16515	*See* UCRL-JC–118404			
2	20:16516	*See* UCRL-JC–118405			
CONF-950388–		(13. geothermal program review; San Francisco, CA (United States); 13-16 Mar 1995)			
1	20:15332	*See* BNL–61531			
CONF-950389–		(Pittsburgh conference and exhibition on analytical chemistry and applied spectroscopy: stimulating the minds of today's and tomorrow's scientists; New Orleans, LA (United States); 5-10 Mar 1995)			
1	20:16178	*See* WAPD-T–3041			
CONF-950402–		(209. American Chemical Society (ACS) national meeting; Anaheim, CA (United States); 2-6 Apr 1995)			
6	20:14716	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009370	MF-108
CONF-9504125–		(High performance functional computing; Denver, CO (United States); 9-11 Apr 1995)			
1	20:17402	*See* UCRL-JC–119529			
CONF-9504129–		(1995 international symposium on public works and the human environment; Seattle, WA (United States); 19-21 Apr 1995)			
1	20:15772	*See* INEL–94/00134			
CONF-9504131–		(5. American Nuclear Society (ANS) topical meeting on emergency preparedness and response; Aiken, SC (United States); Apr 1995)			
1	20:15169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008904	
CONF-9504132–		(Spring workshop on basic science using pulsed power; Santa Barbara, CA (United States); 5-7 Apr 1995)			
1	20:17257	*See* LA-UR–95-1110			
2	20:16775	*See* LA-UR–95-1097			

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CONF-9504133–		(7. international symposium on interactions of the effects of munitions with structures; Mannheim (Germany); 24-28 Apr 1995)			
1	20:16467	*See* UCRL-JC–118313			
CONF-9504134–		(HAZMACON '95: hazardous materials management conference and exhibition; San Jose, CA (United States); 4-6 Apr 1995)			
1	20:15051	*See* UCRL-JC–118902			
2	20:15050	*See* UCRL-JC–118901			
CONF-9504135–		(5. annual waste-management education and research consortium (WERC) technology development conference; Las Cruces, NM (United States); 18-20 Apr 1995)			
1	20:16557	*See* SAND–95-0574C			
CONF-9504136–		(Long-pulse spallation source (LPSS) workshop; Berkeley, CA (United States); Apr 1995)			
1	20:16427	*See* LA-UR–95-1092			
CONF-9504137–		(SPIE: aero sense conference; San Francisco, CA (United States); 17-21 Apr 1995)			
1	20:16474	*See* LA-UR–95-1072			
CONF-9504138–		(International power electronics conference; Yokohama (Japan); 3-7 Apr 1995)			
1	20:17243	*See* GA-A–21957			
2	20:17261	*See* PPPL-CFP–3206			
CONF-9504139–		(ATM forum technical committee meeting; Denver, CO (United States); 10 Apr 1995)			
1	20:17439	*See* SAND–95-0666C			
2	20:17438	*See* SAND–95-0665C			
CONF-950414–		(American power conference; Chicago, IL (United States); 18-20 Apr 1995)			
1	20:17262	*See* PPPL-CFP–3231			
CONF-9504140–		(Spring meeting on optoelectronic and photonic devices; Tucson, AZ (United States); 6 Apr 1995)			
1	20:16446	*See* SAND–95-0588C			
CONF-950420–		(International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995)			
22	20:16613	*See* UCRL-JC–118754			
CONF-950426–		(3. international conference on nuclear engineering; Kyoto (Japan); 23-27 Apr 1995)			
1	20:14938	*See* WHC-SA–2491			
CONF-950451–		(21. national environmental symposium and exhibition; San Diego, CA (United States); 17-21 Apr 1995)			
1	20:15667	*See* SAND–95-0570C			
CONF-950463–		(3. international Charles Parsons turbine conference: materials engineering in turbines and compressors; Newcastle upon Tyne (United Kingdom); 25-27 Apr 1995)			
1	20:15803	*See* DOE/MC/29257–95/C0452			
CONF-950472–		(SPIE international symposium on aerospace/defense sensing and dual-use photonics; Orlando, FL (United States); 17-21 Apr 1995)			
4	20:17378	*See* LA-UR–95-883			
5	20:16438	*See* SAND–94-2519C			
6	20:16448	*See* SAND–95-0721C			
CONF-950494–		(Natural gas research, development and demonstration contractors review meeting; Baton Rouge, LA (United States); 4-6 Apr 1995)			
3	20:15705	*See* DOE/MC/28138–95/C0454			
CONF-950506–		(5. topical meeting on tritium technology in fission, fusion and isotopic applications; Ispra (Italy); 28 May - 3 jun 1995)			
4	20:17255	*See* LA-UR–95-1057			
5	20:17256	*See* LA-UR–95-1089			
6	20:17260	*See* PPPL-CFP–3205			
7	20:15220	*See* WSRC-MS–94-0488			

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CONF-950512–		(Particle accelerator conference; Dallas, TX (United States); 1-5 May 1995)			
1	20:16387	*See* SAND–95-0686C			
CONF-950514–		(World geothermal congress: worldwide utilization of geothermal energy; Florence (Italy); 18-31 May 1995)			
11	20:15315	*See* LA-UR–95-164			
CONF-9505145–		(Symposium on theory of computing; Las Vegas, NV (United States); 29 May - 1 jun 1995)			
2	20:17329	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009123	MF-405
CONF-9505169–		(International robots and vision automation show and conference; Detroit, MI (United States); 8-11 May 1995)			
2	20:16276	*See* SAND–95-0610C			
CONF-950518–		(187. meeting of the Electrochemical Society; Reno, NV (United States); 21-26 May 1995)			
3	20:16118	*See* SAND–95-0664C			
4	20:16117	*See* SAND–95-0583C			
CONF-9505188–		(1995 American Institute of Hydrology annual meeting; Denver, CO (United States); 14-18 May 1995)			
2	20:15147	*See* RFP–4935			
CONF-9505191–		(17. Department of Energy computer security group training conference; Milwaukee, WI (United States); 1-4 May 1995)			
1	20:15210	*See* LA-UR–95-1039			
2	20:17389	*See* SAND–95-0590C			
CONF-9505193–		(1995 international conference on robotics and automation; Nagoya (Japan); 21-27 May 1995)			
4	20:17384	*See* SAND–94-3129C			
CONF-9505195–		(Nuclear criticality technology and safety project (NCTSP) annual meeting; San Diego, CA (United States); 17 May 1995)			
2	20:15592	*See* LA-UR–95-951			
CONF-9505196–		(1995 industrial and commercial power systems conference; San Antonio, TX (United States); 8-10 May 1995)			
1	20:15615	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008844	MF-1370
CONF-9505197–		(Autonomous vehicles in mine countermeasures symposium; Monterey, CA (United States); 5 May 1995)			
1	20:16460	*See* LA-UR–95-841			
CONF-9505201–		(41. international instrumentation symposium; Denver, CO (United States); 7-11 May 1995)			
1	20:16277	*See* SAND–95-0662C			
CONF-9505202–		(Solution Mining Research Institute spring meeting; New Orleans, LA (United States); 1 May 1995)			
1	20:16303	*See* SAND–95-0681C			
CONF-9505203–		(8. annual IPES meeting; Compiegne (France); 6-12 May 1995)			
1	20:15886	*See* LA-UR–95-626			
CONF-950537–		(15. international symposium on ballistics; Haifa (Israel); 21-24 May 1995)			
2	20:16116	*See* SAND–95-0379C			
3	20:16469	*See* UCRL-JC–118383			
4	20:16468	*See* UCRL-JC–118375			
CONF-950550–		(13. aerodynamics decelerator systems technology conference; Clearwater, FL (United States); 15-19 May 1995)			
1	20:16457	*See* SAND–94-2373C			
CONF-950570–		(International high-level radioactive waste management conference: progress toward understanding; Las Vegas, NV (United States); 1-5 May 1995)			
17	20:15148	*See* UCRL-JC–119115			

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CONF-950582–		(13. AIAA aerodynamic decelerator systems technology conference; Clearwater Beach, FL (United States); 15-19 May 1995)			
1	20:16776	*See* SAND–94-2324C			
CONF-950601–		(Annual meeting of the American Nuclear Society; Philadelphia, PA (United States); 25-29 Jun 1995)			
1	20:16258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003445	MF-700
2	20:16286	*See* WSRC-MS–94-0544			
3	20:17385	*See* SAND–95-0140C			
4	20:16426	*See* LA-UR–95-107			
5	20:15002	*See* LA-UR–95-113			
6	20:16259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009072	MF-512
7	20:16260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009071	MF-505
8	20:15597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009180	MF-406
9	20:16924	*See* WAPD-T–3044			
CONF-9506105–		(INFOS '95: insulating films on semiconductors conference; Grenoble (France); 7-10 Jun 1995)			
1	20:16334	*See* SAND–94-2619C			
CONF-9506141–		(15. international congress on acoustics (ICA); Trondheim (Norway); 26-30 Jun 1995)			
2	20:16714	*See* LA-UR–95-640			
CONF-9506143–		(1995 Department of Energy/Agency of Industrial Science and Technology international fuel cell symposium; Yokohama (Japan); 12-16 Jun 1995)			
1	20:15730	*See* DOE/METC/C–95/7170			
CONF-9506144–		(5. international conference on numerical methods in industrial forming processes (NUMIFORM); Ithaca, NY (United States); 18-21 Jun 1995)			
1	20:15887	*See* LA-UR–95-784			
CONF-9506145–		(1995 Society for Experimental Mechanics spring conference; Grand Rapids, MI (United States); 12-14 Jun 1995)			
1	20:15642	*See* SAND–95-0435C			
CONF-9506149–		(6. international conference on rapid prototyping; Dayton, OH (United States); 4-6 Jun 1995)			
2	20:15796	*See* SAND–94-2565C			
CONF-9506168–		(EUROPYRO '95; Tours (France); 5-9 Jun 1995)			
1	20:16466	*See* UCRL-JC–117774			
CONF-9506169–		(24. annual symposium on incremental motion control systems and devices; San Jose, CA (United States); 7 Jun 1995)			
1	20:15889	*See* LA-UR–95-1130			
CONF-9506170–		(Condensed matter theories; Caracas (Venezuela); 12-17 Jun 1995)			
1	20:16774	*See* LA-UR–95-1082			
CONF-9506173–		(1995 ASME summer bioengineering conference; Beaver Creek, CO (United States); 28 Jun - 2 jul 1995)			
1	20:17403	*See* UCRL-JC–119773			
CONF-9506174–		(Test Facility working group conference; Las Vegas, NV (United States); 12-16 Jun 1995)			
1	20:16447	*See* SAND–95-0670C			
CONF-950624–		(Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; San Diego, CA (United States); 24-28 Jun 1995)			
1	20:15743	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009127	MF-1600
CONF-950629–		(ASME international gas turbine and aeroengine congress and exposition: land, sea and air; Houston, TX (United States); 5-8 Jun 1995)			
1	20:15368	*See* DOE/MC/29257–95/C0410			
2	20:15804	*See* DOE/METC/C–95/7183			
3	20:16300	*See* DOE/METC/C–95/7179			
4	20:14725	*See* DOE/METC/C–95/7184			
5	20:15912	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010220	MF-1505

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-950644–		(Conference on functional programming languages and computer architectures; La Jolla, CA (United States); 26-28 Jun 1995)			
1	20:17374	*See* LA-UR–94-4088			
CONF-950646–		(Air and Waste Management Association meeting; San Antonio, TX (United States); 18-23 Jun 1995)			
1	20:16484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006161	MF-407
2	20:16567	*See* WHC-SA–2755			
3	20:16272	*See* SAND–94-2409C			
4	20:16700	*See* SAND–95-0138C			
5	20:16485	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007619	MF-702
6	20:14936	*See* SAND–95-0143C			
9	20:16193	*See* NREL/TP–473-7575			
10	20:16273	*See* SAND–94-2485C			
13	20:15652	*See* FEMP–2401			
15	20:15767	*See* UCRL-JC–120680			
CONF-950653–		(1995 American control conference; Seattle, WA (United States); Jun 1995)			
1	20:17373	*See* LA-UR–94-3256			
CONF-950655–		(35. US symposium on rock mechanics; South Lake Tahoe, NV (United States); 4-7 Jun 1995)			
2	20:15029	*See* SAND–94-2136C			
3	20:15027	*See* SAND–94-2134C			
4	20:15030	*See* SAND–94-2313C			
5	20:15031	*See* SAND–94-2343C			
6	20:16122	*See* UCRL-JC–118417			
CONF-950683–		(4. international symposium on solid oxide fuel cells; Yokohama (Japan); 18-23 Jun 1995)			
1	20:15729	*See* DOE/MC/28055–95/C0447			
CONF-950686–		(Joint applied mechanics and materials summer meeting; Los Angeles, CA (United States); 28-30 Jun 1995)			
1	20:16113	*See* SAND–94-2298C			
CONF-950706–		(19. international conference on the physics of electronic and the atomic collisions; Whistler (Canada); 26 Jul - 1 aug 1995)			
1	20:16946	*See* LA-UR–95-790			
CONF-9507100–		(Plasticity and its current applications symposium; Osaka (Japan); 17-21 Jul 1995)			
1	20:15888	*See* LA-UR–95-918			
2	20:15885	*See* LA-UR–95-619			
CONF-9507101–		(Technology Transfer Society annual conference; Washington, DC (United States); Jul 1995)			
1	20:15673	*See* LA-UR–95-1104			
CONF-950716–		(32. annual IEEE international nuclear and space radiation effects conference; Madison, WI (United States); 17-21 Jul 1995)			
1	20:16935	*See* SAND–95-0155C			
CONF-950720–		(30. AIAA/SAE/ASME joint propulsion conference and exhibit; San Diego, CA (United States); 10-12 Jul 1995)			
1	20:16254	*See* SAND–95-8456C			
CONF-950737–		(36. Rocky Mountain conference on analytical chemistry; Denver, CO (United States); 31 Jul - 5 aug 1995)			
1	20:14902	*See* Y/DK–1043			
CONF-950740–		(Joint ASME/JSME pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995)			
2	20:17383	*See* SAND–94-2205C			
3	20:16261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005900	MF-406
4	20:14915	*See* WSRC-MS–94-0605			
5	20:15901	*See* WSRC-MS–94-0463			
6	20:15129	*See* WSRC-MS–94-0604			
7	20:15477	*See* WSRC-MS–95-0008			
8	20:15612	*See* WHC-SA–2633			
9	20:16263	*See* LA-UR–95-47			
1-Rev.1	20:16281	*See* UCRL-JC–118797-Rev.1			
10	20:16471	*See* SAND–94-2514C			

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11	20:16470	*See* SAND–94-2294C			
12	20:15668	*See* UCRL-JC–118798			
13	20:16472	*See* SAND–94-2891C			
14	20:17388	*See* SAND–95-0501C			
15	20:14965	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008902	MF-406; MF-405
16	20:15464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009034	
18	20:15823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009135	MF-1419
19	20:15824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009033	MF-1505
21	20:17379	*See* LA-UR–95-1117			
22	20:15185	*See* UCRL-JC–118795			
23	20:15454	*See* BNL-NUREG–61565			
24	20:15463	*See* BNL-NUREG–61558			
25	20:16257	*See* BNL–61540			
26	20:16275	*See* SAND–95-0582C			
CONF-950777–		(Accelerator-driven transmutation technology (ADTT) conference; Las Vegas, NV (United States); 24-29 Jul 1995)			
1	20:15003	*See* LA-UR–95-213			
2	20:15004	*See* LA-UR–95-817			
CONF-950778–		(ACM conference on computational learning theory; Santa Cruz, CA (United States); Jul 1995)			
1	20:17376	*See* LA-UR–95-38			
CONF-950786–		(International conference on computational engineering science; Mauna Lani, HI (United States); 30 Jul - 3 aug 1995)			
1	20:16755	*See* SAND–95-0095C			
2	20:17386	*See* SAND–95-0349C			
3	20:15892	*See* SAND–95-0284C			
4	20:15028	*See* SAND–94-2135C			
5	20:16046	*See* SAND–94-2869C			
6	20:16115	*See* SAND–95-0351C			
7	20:16274	*See* SAND–94-2637C			
CONF-950789–		(1995 world congress on neural networks; Washington, DC (United States); Jul 1995)			
1	20:17377	*See* LA-UR–95-423			
CP–					
94-9	20:15650	*See* DOE/ER/61721–1			
CRIE-R–					
93010	20:17405	OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan		DE95769746	
93011	20:17406	OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan		DE95769741	
93014	20:17407	OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan		DE95769744	
CRIE-T–					
93073	20:15287	OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan		DE95769745	
CRIE-U–					
94004	20:15776	OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan		DE95769742	
CRIE-Y–					
94001	20:15670	OSTI; NTIS; Available from Central Research Institute of Electric Power Industry, 1-6-1, Otemachi, Chiyoda-ku, Tokyo, Japan		DE95769743	
CTH-PUBL–					
93-8	20:15744	OSTI; NTIS		DE95766686	
DEFU-TR–					
343	20:16488	OSTI; NTIS		DE95772414	
DESY–					
95-002	20:16821	OSTI; NTIS (US Sales Only); INIS		DE95770021	
95-003	20:16822	OSTI; NTIS (US Sales Only); INIS		DE95770020	
95-005	20:16396	OSTI; NTIS (US Sales Only); INIS		DE95770018	

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95-023	20:16823	OSTI; NTIS (US Sales Only); INIS		DE95770007	
DFTT–					
13/95	20:16823	*See* DESY–95-023			
DOE-HDBK–					
1086-95	20:17285	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011251	MF-500
DOE-STD–					
7501-95	20:17288	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011501	MF-500
DOE/AL/62350–					
129-Rev.1	20:15140	*See* DOE/AL/62350–130			
130	20:15140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009880	MF-2010
159/2/95	20:15141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009461	MF-2010
DOE/AL/99286–					
T5	20:15777	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010541	MF-1400
DOE/BC–					
14661-10	20:14816	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000140	PC-122
95/3/SP	20:14815	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000137	PC-122
95/5/SP	20:14797	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000139	PC-122; PC-125
DOE/BC/14831–					
13	20:14817	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010481	MF-122
14	20:14818	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010778	MF-122
DOE/BC/14852–					
9	20:14819	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010779	MF-122
11	20:14820	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010780	MF-122
DOE/BC/14882–					
11	20:14821	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010475	MF-122
DOE/BC/14886–					
9	20:14822	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000138	PC-122
DOE/BC/14891–					
5	20:14798	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010464	MF-122
6	20:14823	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010485	MF-122
DOE/BC/14892–					
4	20:14824	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010782	MF-122
DOE/BC/14894–					
6	20:14799	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010480	MF-122
DOE/BC/14956–					
9	20:14825	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010483	MF-122
DOE/BC/14958–					
9	20:14826	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010477	MF-122
DOE/BC/14960–					
7	20:14827	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000120	PC-122
DOE/BC/14961–					
6	20:14828	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010484	MF-122
DOE/BC/14970–					
2	20:14829	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010377	MF-122
2-Rev.	20:14800	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010786	MF-122
DOE/BC/14971–					
2	20:15812	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010376	MF-131
DOE/BC/14977–					
3	20:14830	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010383	MF-122
DOE/BC/14982–					
1	20:14801	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010482	MF-122
DOE/BC/14983–					
3	20:14831	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010382	MF-122
DOE/BC/14984–					
2	20:14832	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010379	MF-122
DOE/BC/14990–					
2	20:14833	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010471	MF-122
DOE/BP–					
1-9351	20:15618	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009163	MF-907
17758-2	20:15280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009164	MF-902
2186	20:15698	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009165	MF-900
2522	20:15710	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009171	
2524	20:15713	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009161	MF-900
2544	20:15620	*See* DOE/EIS–0183			
2552	20:15283	*See* DOE/EA–0940/3/95			
92818-3	20:15281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009166	MF-902
95009167	20:15277	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009167	MF-900

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DOE/CE/15599–					
T2	20:15913	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010542	MF-1406
DOE/CE/15600–					
T5	20:14834	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010371	MF-123
DOE/CE/15601–					
T1	20:15312	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010170	MF-1303
DOE/CE/15604–					
T2	20:15366	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010373	MF-1408
DOE/CE/15612–					
T3	20:15250	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010174	MF-1414
DOE/CE/23810–					
51B	20:15778	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010185	MF-1600
DOE/CE/40735–					
2	20:15251	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009677	MF-1400
3	20:15252	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009678	MF-1400
DOE/EA–					
0906	20:14966	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009932	MF-630
0940/1/95	20:15282	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009170	
0940/3/95	20:15283	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95009168	MF-902
0944	20:14967	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008190	MF-630
1026	20:15647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009936	MF-630
1032	20:15648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009935	MF-630
1046	20:15649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009931	MF-630
DOE/EE–					
0043	20:15313	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010519	MF-1240
0331	20:15704	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010406	MF-101
DOE/EIA–					
0204(95/01)	20:15687	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009301	MF-950
0318(92)	20:15714	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95009672	MF-950
0380(95/04)	20:14850	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009667	MF-950
0543(94/4Q)	20:14790	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95010321	MF-950
0546(94)	20:17283	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95008208	MF-950
M060(95)	20:14791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010094	MF-950
M067(95)	20:15715	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008309	MF-950
M068-B/1	20:15688	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010355	MF-950
DOE/EIS–					
0183	20:15620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009169	MF-902
DOE/EP/10050–					
T3	20:15637	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008743	MF-900
DOE/ER–					
0640	20:15170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010163	MF-402
0645	20:16664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010405	MF-407
DOE/ER/10873–					
T2	20:16605	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008638	MF-408
DOE/ER/13034–					
2	20:16288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009679	MF-406
DOE/ER/13412–					
T1	20:14802	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010168	MF-403
DOE/ER/13791–					
T2	20:15288	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009806	MF-401
DOE/ER/13829–					
T1	20:16180	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010177	MF-401
DOE/ER/14115–					
T1	20:15331	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009682	MF-403
DOE/ER/20044–					
T2	20:16601	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008630	MF-408
DOE/ER/25054–					
T2	20:16597	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010178	MF-400
T3	20:16598	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010179	MF-400
DOE/ER/25063–					
T14	20:17408	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010164	MF-405
DOE/ER/40272–					
212	20:16810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009922	MF-414

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DOE/ER/40370–					
7	20:16876	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010535	MF-413
DOE/ER/40445–					
46	20:16397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010156	MF-414
DOE/ER/40481–					
T1	20:16763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010159	MF-412; MF-413
DOE/ER/40633–					
3	20:16780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010155	MF-414
DOE/ER/40842–					
T1	20:16824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010165	MF-414
DOE/ER/45233–					
10	20:16129	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010154	MF-411
DOE/ER/52143–					
T3	20:17237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008728	MF-423
DOE/ER/60460–					
T4	20:16608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009691	MF-408
DOE/ER/60960–					
T1	20:16665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010176	MF-408
DOE/ER/61704–					
1	20:16609	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009681	MF-408
DOE/ER/61721–					
1	20:15650	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008168	MF-402
DOE/ER/61761–					
1	20:16489	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009647	MF-406
DOE/ER/75633–					
T3	20:15672	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010180	MF-400
DOE/ER/75758–					
T1	20:15802	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010169	MF-402
DOE/ER/75788–					
1	20:15382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010153	MF-406
DOE/ET/15601–					
T64	20:15720	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009820	MF-112
T65	20:15721	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009821	MF-112
T66	20:16450	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009822	MF-112
T67	20:15722	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009823	MF-112
T68	20:15723	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009824	MF-112
T69	20:14771	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009825	MF-112
T70	20:15724	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009826	MF-112
T71	20:15725	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009827	MF-112
DOE/ET/53088–					
691	20:17147	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008750	MF-420
692	20:16958	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008952	MF-421
694	20:17148	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008748	MF-420
697	20:17149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009115	MF-420
698	20:16764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009116	MF-420
DOE/EW/00003–					
3	20:14968	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009649	MF-2000
DOE/GO–					
10095-019	20:15671	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011856	PC-1370
10095-073	20:15745	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000290	MF-1600
10095-074	20:15746	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000291	MF-1600
10095-082	20:15289	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011871	PC-1260
10095-085	20:15302	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000240	PC-1300
10095-097	20:15779	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006881	PC-1400
10095-125	20:15307	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004025	PC-1400
10095-129	20:15747	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000228	MF-1600
DOE/HR–					
0130	20:17286	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010696	MF-900
DOE/HWP–					
130	20:15171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009602	MF-2080

DOE/IG–

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/IG–					
0368	20:14947	OSTI (Free of Charge)		TI95010664	PC-960
0369	20:17287	OSTI (Free of Charge)		TI95010663	PC-960
DOE/LLW–					
195	20:14969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008619	MF-2020
DOE/MC/10637–					
3292	20:15367	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000069	PC-106
DOE/MC/24116–					
4035	20:14717	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010529	MF-109
DOE/MC/24132–					
4026	20:14772	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010528	MF-103
DOE/MC/25140–					
4009	20:14718	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000081	MF-106
DOE/MC/25177–					
3935	20:14719	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000028	PC-106
DOE/MC/25366–					
4006	20:14720	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011399	MF-106; MF-113
DOE/MC/27115–					
4010	20:15264	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000082	PC-108
DOE/MC/27225–					
4039	20:14721	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010525	MF-109
DOE/MC/27229–					
4002	20:14773	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000071	MF-104
DOE/MC/28055–					
95/C0447	20:15729	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008361	MF-110
DOE/MC/28060–					
95/C0443	20:14750	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008360	MF-105
95/C0445	20:14751	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008359	MF-105
DOE/MC/28138–					
95/C0454	20:15705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011041	MF-132
DOE/MC/29109–					
3958	20:16521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000049	PC-2070
DOE/MC/29118–					
95/C0428	20:16522	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007970	MF-2020
DOE/MC/29244–					
4038	20:14752	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011400	MF-103; MF-107; MF-113
DOE/MC/29246–					
3981	20:14722	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000061	MF-106; MF-113
DOE/MC/29257–					
4005	20:14774	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000077	MF-111
95/C0410	20:15368	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005954	MF-111
95/C0452	20:15803	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010308	MF-111
DOE/MC/29261–					
4020	20:14723	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000090	PC-106
DOE/MC/29467–					
3986	20:17409	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000063	MF-2000
4036	20:16523	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010526	MF-113
DOE/MC/30012–					
4021	20:14724	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000091	MF-106
DOE/MC/30170–					
95/C0438	20:14970	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008947	MF-2020
DOE/MC/30246–					
3973	20:15369	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000057	MF-111
DOE/MC/30247–					
3999	20:15370	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000064	MF-111
DOE/MC/30251–					
3975	20:14744	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000059	MF-105
DOE/METC/C–					
95/7170	20:15730	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008210	MF-110
95/7176	20:16299	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008774	MF-103; MF-106
95/7179	20:16300	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009548	MF-111; MF-104

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95/7183	20:15804	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008945	MF-111
95/7184	20:14725	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010307	MF-106; MF-103
DOE/MT/91004–					
1	20:14866	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000136	PC-122
DOE/MT/92009–					
10	20:14865	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010790	MF-122
DOE/MT/92020–					
9	20:14845	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010788	MF-125
DOE/MT/92021–					
9	20:14775	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010473	MF-103
DOE/MT/94003–					
2	20:14835	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010386	MF-122
DOE/MT/94006–					
2	20:14868	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010385	MF-122
DOE/NV–					
391	20:16524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008215	MF-700
DOE/NV/10845–					
46	20:16525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009110	MF-702
DOE/NV/10872–					
T176	20:17410	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010173	MF-800
DOE/NV/11432–					
163	20:16666	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007960	MF-702
167	20:15142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009439	MF-702
173	20:16490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010670	MF-630
T5	20:14971	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008140	MF-702
DOE/OR–					
03-1195-D2	20:14972	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008964	MF-2030
DOE/OR/21389–					
T12	20:15237	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010166	MF-1310
DOE/OSTI–					
3406-Suppl.4-Add.1	20:14973	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014499	PC-814
DOE/PC/88881–					
T24	20:14706	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009345	MF-102
T25	20:14726	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009346	MF-102
DOE/PC/89663–					
T15	20:14707	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009354	MF-101
DOE/PC/89757–					
T1	20:14745	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005301	PC-113
DOE/PC/89881–					
T12	20:14753	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009684	MF-113
T13	20:14754	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009685	MF-113
DOE/PC/90018–					
T10	20:15267	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010398	MF-104
T8	20:15265	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010397	MF-104
T9	20:15266	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010399	MF-104
DOE/PC/90042–					
T11	20:15268	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009358	MF-108
T12	20:15269	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009359	MF-108
T13	20:15270	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009360	MF-108
DOE/PC/90094–					
T5	20:16301	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009663	MF-104
DOE/PC/90155–					
T10	20:14779	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011473	MF-104
T11	20:14780	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011474	MF-104
T12	20:14781	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011475	MF-104
T14	20:14782	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011477	MF-104
T15	20:14783	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011478	MF-104
T16	20:14784	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011479	MF-104
T17	20:14785	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011480	MF-104
T7	20:14776	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011470	MF-104
T8	20:14777	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011471	MF-104
T9	20:14778	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011472	MF-104
DOE/PC/90165–					
T5	20:14786	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007543	PC-104
DOE/PC/90286–					
T8	20:14787	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009683	MF-103
DOE/PC/90296–					
T10	20:14727	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006351	PC-102

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/PC/90297–					
T11	20:17142	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009817	MF-112
T13	20:17143	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009819	MF-112
DOE/PC/90311–					
T3	20:14708	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005661	PC-102
DOE/PC/90361–					
T16	20:15374	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004259	PC-105
DOE/PC/90362–					
T1-Vol.1	20:14755	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004263	PC-105
DOE/PC/90364–					
T9	20:14756	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011397	PC-105
DOE/PC/90547–					
T17	20:14757	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009351	MF-105
DOE/PC/91034–					
T10	20:15271	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009363	MF-108
T11	20:15272	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009365	MF-108
DOE/PC/91040–					
48	20:14728	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010505	MF-108
DOE/PC/91051–					
T8-Vol.2	20:14729	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009648	MF-108
DOE/PC/91055–					
T10	20:14730	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010395	MF-108
DOE/PC/91161–					
T10	20:15780	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010367	MF-104
DOE/PC/91162–					
T12	20:15371	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009357	MF-104
DOE/PC/91281–					
T13	20:14731	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010628	MF-108
DOE/PC/91287–					
16	20:14732	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007893	PC-108
DOE/PC/91291–					
T14	20:14733	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010647	MF-108
DOE/PC/91292–					
T13	20:14788	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009344	MF-104
DOE/PC/91293–					
13	20:14758	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010500	MF-105
DOE/PC/91336–					
T6	20:14759	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009347	MF-103
DOE/PC/92110–					
T7	20:15273	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009645	MF-108
DOE/PC/92111–					
T8	20:15274	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009366	MF-125
DOE/PC/92113–					
T6	20:15275	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009642	MF-113
DOE/PC/92120–					
T7	20:14734	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009367	MF-108
DOE/PC/92122–					
T8	20:14735	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010616	MF-108
DOE/PC/92147–					
6	20:14736	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005527	MF-108
8	20:14737	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011365	MF-108
DOE/PC/92206–					
T8	20:14709	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009361	MF-102
DOE/PC/92208–					
T9	20:14710	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009336	MF-102
DOE/PC/92521–					
T214	20:15375	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008000	MF-105
DOE/PC/92527–					
T9	20:14746	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010364	MF-108
DOE/PC/92534–					
7	20:14760	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010499	MF-105
DOE/PC/92535–					
T9	20:14761	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009338	MF-105
DOE/PC/92542–					
T9	20:15836	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009643	MF-114
DOE/PC/92544–					
10	20:14747	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009632	MF-113
DOE/PC/92548–					
T9	20:14762	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010633	MF-105
DOE/PC/92550–					
9	20:14711	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009630	MF-102

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/PC/93205– T5	20:14738	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010365	MF-108
DOE/PC/93220– T5	20:14739	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010393	MF-105
DOE/PC/93223– T4	20:14748	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010394	MF-113
DOE/PC/94055– T1	20:14740	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009339	MF-108
DOE/PC/94066– T1	20:15276	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010620	MF-108
DOE/PC/94116– T3	20:14712	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010627	MF-102; MF-104
DOE/PC/94203– T1	20:14789	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010631	MF-104
DOE/PC/94226– T1	20:14749	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010366	MF-115
DOE/PC/94227– T2	20:15651	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010363	MF-107
DOE/R6/99305– T3	20:15748	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009807	MF-1600
DOE/RF/00653– T1	20:16713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005771	MF-721
DOE/RL– 88-30-Rev.4-Vol.1	20:14974	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009600	MF-2000
88-30-Rev.4-Vol.2	20:14975	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009601	MF-2000
93-54-Draft-A	20:15172	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007600	MF-2070
93-81	20:15143	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009565	MF-2070
93-94-Rev.1	20:14976	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009086	MF-630
94-131	20:14980	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009011	MF-2000
94-137	20:15453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009139	MF-630; MF-721
94-42	20:15173	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009555	MF-2070
94-42-Draft-A	20:14977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009615	MF-2070
94-47-Rev.1	20:14978	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008220	MF-2050
94-53-Draft-A	20:15174	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008318	MF-2010
94-55-Rev.1	20:14979	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009997	MF-2000
94-59-Draft-A	20:15144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009557	MF-2030; MF-2010
95-23	20:14981	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009087	MF-600
DOE/RW– 0462	20:14920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009036	MF-840
DOE/SF/16305– T1	20:15308	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010172	MF-1600
DOE/SF/16306– 46	20:15309	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010486	MF-1302
DOE/SF/18852– T50	20:15230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010306	MF-528
DOE/SWPA– 9501	20:15711	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009327	MF-900
DOE/WIPP– 93-025-Rev.1	20:14982	OSTI; NTIS; INIS; Copies of this document may be obtained by calling 1-800-336-WIPP (1-800-366-9477).; GPO Dep.	E 1.99:	DE95009650	MF-800
DOE/YMSCO– 002	20:14983	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009812	MF-814

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DSF-T–					
5/95	20:16787	*See* IC–95/24			
DTU-ISVA-PR–					
75	20:16289	OSTI; NTIS		DE95766444	
DTU-LV-MEDD–					
274	20:15310	OSTI; NTIS		DE95772359	
ECE/ENVWA–					
32(add.1)	20:15214	OSTI; NTIS (US Sales Only); INIS		DE95628138	
EGG-M–					
94409	20:15837	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008603	MF-1419
EGG-WM–					
10962	20:14984	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009458	MF-2020
EGG-WTD–					
11316	20:15177	*See* INEL–94/0005-Rev.1			
ENEA-RT-AMB–					
92-17	20:16528	OSTI; NTIS (US Sales Only)		DE95771049	
92-21	20:16579	OSTI; NTIS (US Sales Only)		DE95771050	
92-31	20:15221	OSTI; NTIS (US Sales Only)		DE95771051	
94-26	20:16580	OSTI; NTIS (US Sales Only)		DE95771022	
95-02	20:17330	OSTI; NTIS (US Sales Only)		DE95771030	
ENEA-RT-ERG-FUS–					
93-01	20:17150	OSTI; NTIS (US Sales Only)		DE95771029	
93-12	20:17151	OSTI; NTIS (US Sales Only)		DE95771025	
93-35	20:17238	OSTI; NTIS (US Sales Only)		DE95771054	
94-01	20:17239	OSTI; NTIS (US Sales Only)		DE95771036	
94-08	20:17152	OSTI; NTIS (US Sales Only)		DE95771035	
94-10	20:17240	OSTI; NTIS (US Sales Only)		DE95771008	
94-11	20:17153	OSTI; NTIS (US Sales Only)		DE95771034	
94-12	20:17154	OSTI; NTIS (US Sales Only)		DE95771027	
94-15	20:16925	OSTI; NTIS (US Sales Only)		DE95771033	
94-16	20:17155	OSTI; NTIS (US Sales Only)		DE95771032	
94-19	20:17156	OSTI; NTIS (US Sales Only)		DE95771047	
94-20	20:17161	OSTI; NTIS (US Sales Only)		DE95771024	
94-22	20:17162	OSTI; NTIS (US Sales Only)		DE95771048	
ENEA-RT-INN–					
94-04	20:15781	OSTI; NTIS (US Sales Only)		DE95771021	
94-20	20:16344	OSTI; NTIS (US Sales Only)		DE95771055	
94-44	20:16614	OSTI; NTIS (US Sales Only)		DE95771023	
94-46	20:15917	OSTI; NTIS (US Sales Only)		DE95771031	
94-47	20:16389	OSTI; NTIS (US Sales Only)		DE95771026	
ES/ER/TM–					
146	20:17331	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009998	MF-2000
ES/ESH–					
50	20:15145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006673	MF-2000
ESTSC–					
000158D0VAX03	20:17332	ESTSC			
000158SUN0001	20:17333	ESTSC			
000175IBMPC02	20:17334	ESTSC			
000702D0VAX00	20:17335	ESTSC			
000723IB38600	20:17336	ESTSC			
000749IBMPC00	20:17337	ESTSC			
000749SPARC00	20:17338	ESTSC			
000766AL00000	20:17339	ESTSC			
ESTSC/NRC–					
000004IBMPC02	20:17340	ESTSC; Source Code Not Included			
000005IBMPC01	20:17341	ESTSC			
000007D113400	20:17342	ESTSC			
ETDE-DE–					
53	20:16704	OSTI; NTIS (US Sales Only)		DE95769152	
64	20:14767	OSTI; NTIS (US Sales Only)		DE95768626	
65	20:14768	OSTI; NTIS (US Sales Only)		DE95769225	
66	20:16491	OSTI; NTIS (US Sales Only)		DE95768719	
67	20:15805	OSTI; NTIS (US Sales Only)		DE95768484	
68	20:16492	OSTI; NTIS (US Sales Only)		DE95768859	
69	20:16493	OSTI; NTIS (US Sales Only)		DE95768733	
70	20:15716	OSTI; NTIS (US Sales Only)		DE95768809	
71	20:14792	OSTI; NTIS (US Sales Only)		DE95769851	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
72	20:16251	OSTI; NTIS (US Sales Only)		DE95769291	
73	20:16705	OSTI; NTIS (US Sales Only)		DE95769007	
74	20:16706	OSTI; NTIS (US Sales Only)		DE95769250	
75	20:14765	OSTI; NTIS (US Sales Only)		DE95768933	
76	20:15686	OSTI; NTIS (US Sales Only)		DE95769270	
77	20:15768	OSTI; NTIS (US Sales Only)		DE95769283	
78	20:15782	OSTI; NTIS (US Sales Only)		DE95769269	
80	20:16494	OSTI; NTIS (US Sales Only)		DE95768531	
81	20:14769	OSTI; NTIS (US Sales Only)		DE95769892	
82	20:15299	OSTI; NTIS (US Sales Only)		DE95770353	
83	20:15749	OSTI; NTIS (US Sales Only)		DE95770345	
84	20:16707	OSTI; NTIS (US Sales Only)		DE95770347	
85	20:15783	OSTI; NTIS (US Sales Only)		DE95769903	
86	20:15238	OSTI; NTIS (US Sales Only)		DE95770121	
87	20:16290	OSTI; NTIS (US Sales Only)		DE95769847	
88	20:15806	OSTI; NTIS (US Sales Only)		DE95770354	
89	20:16495	OSTI; NTIS (US Sales Only)		DE95770381	
90	20:15750	OSTI; NTIS (US Sales Only)		DE95769959	
91	20:15751	OSTI; NTIS (US Sales Only)		DE95770323	
92	20:15752	OSTI; NTIS (US Sales Only)		DE95770343	
ETDE-IT–					
95-14	20:17343	OSTI; NTIS (US Sales Only)		DE95771053	
95-15	20:16529	OSTI; NTIS (US Sales Only)		DE95771046	
95-16	20:17163	OSTI; NTIS (US Sales Only)		DE95771052	
ETDE/JP-mf–					
95769798	20:14741	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769798	
95769799	20:14742	OSTI; NTIS; Available from Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769799	
FASAC-TAR–					
95009045	20:16455	OSTI; OSTI; Science Applications International Corp., 1710 Goodridge Drive, P.O. Box 1303, McLean, VA 22102		TI95009045	
FE-MIT–					
92111-9	20:15274	*See* DOE/PC/92111–T8			
FEI–					
2344	20:17344	OSTI; NTIS (US Sales Only); INIS		DE95628885	
2345	20:16858	OSTI; NTIS (US Sales Only); INIS		DE95628973	
2363	20:16877	OSTI; NTIS (US Sales Only); INIS		DE95628985	
2365	20:16075	OSTI; NTIS (US Sales Only); INIS		DE95628644	
FEMP–					
2344	20:14985	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95009013	MF-721
2356	20:14986	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009014	MF-721
2359	20:15175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009016	MF-721
2366	20:14987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009015	MF-721
2367	20:15176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009025	MF-721
2370	20:14988	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009117	MF-2070
2384	20:16530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009012	MF-700
2401	20:15652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009553	MF-707
FEMP/SUB–					
080	20:16581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009020	MF-702
FNAL-TM–					
1901	20:16345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005756	MF-414
1926	20:16375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008955	MF-414
1927	20:16376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008954	MF-414
1929	20:16377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008956	MF-414
FNAL/C–					
94/150-E	20:16398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006684	MF-414
94/383	20:16825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007207	MF-414
95/01-E	20:16399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007961	MF-414
95/018	20:16878	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009108	MF-414
95/037	20:16400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009107	MF-414
95/039	20:16374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009109	MF-414
95/041	20:16826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009106	MF-414
FSC–					
6910	20:17285	*See* DOE-HDBK–1086-95			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
FSEC-CR–					
713-94	20:15308	*See* DOE/SF/16305–T1			
FZR–					
76	20:15389	OSTI; NTIS (US Sales Only); INIS		DE95768491	
GA-A–					
21716	20:17164	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009608	MF-426
21757	20:17241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009606	MF-426
21793	20:17165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008388	MF-427
21814	20:17242	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009605	MF-426
21914	20:17166	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009607	MF-426
21926	20:17167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009609	MF-426
21957	20:17243	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009603	MF-406
GAO/RCED–					
94-200	20:15800	OSTI; U.S. General Accounting Office, P.O. Box 6015, Gaithersburg, MD 20884-6015		TI95009070	
GC–					
37/RES/DEC/1993	20:17289	OSTI; NTIS (US Sales Only); INIS		DE95628155	
GRS–					
111	20:15682	OSTI; NTIS (US Sales Only); INIS		DE95769210	
GSF–					
12/94	20:14989	OSTI; NTIS (US Sales Only); INIS		DE95769156	
7/94	20:16708	OSTI; NTIS (US Sales Only)		DE95769224	
GSF-TL–					
5/94	20:14989	*See* GSF–12/94			
GSI–					
95-09(prepr.)	20:16879	OSTI; NTIS (US Sales Only); INIS		DE95770054	
95-10(prepr.)	20:16880	OSTI; NTIS (US Sales Only); INIS		DE95770053	
95-11(prepr.)	20:16881	OSTI; NTIS (US Sales Only); INIS		DE95770051	
95-12(prepr.)	20:16783	OSTI; NTIS (US Sales Only); INIS		DE95770050	
95-13(prepr.)	20:16882	OSTI; NTIS (US Sales Only); INIS		DE95770028	
95-14(prepr.)	20:16827	OSTI; NTIS (US Sales Only); INIS		DE95770049	
GTK-YST–					
85	20:16531	OSTI; NTIS; INIS		DE95628645	
87	20:16583	OSTI; NTIS; INIS		DE95628660	
HD-IHEP–					
94-07	20:16428	*See* MPI-PhE–94-34			
HEP-PH–					
9503226	20:16823	*See* DESY–95-023			
9503233	20:16812	*See* IC–95/29			
HHS-CFR-B–					
7	20:17290	OSTI; NTIS; INIS		DE95627111	
8	20:17291	OSTI; NTIS; INIS		DE95627112	
9	20:16712	OSTI; NTIS; INIS		DE95627113	
10	20:15598	OSTI; NTIS; INIS		DE95627109	
13	20:15599	OSTI; NTIS; INIS		DE95627110	
HW–					
22572	20:15582	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009449	MF-500
32236	20:15838	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009450	MF-500
41397-Ch.3	20:16130	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010023	MF-504
62273-Rev.2	20:15583	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009507	MF-504
77018	20:14913	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010022	MF-520
IAE–					
2152/6	20:15839	OSTI; NTIS; INIS		DE95628606	
2155/6	20:15840	OSTI; NTIS; INIS		DE95628607	
2158/2	20:15460	OSTI; NTIS; INIS		DE95628733	
IAEA–					
12-SP-384.37	20:15482	OSTI; NTIS (US Sales Only); INIS		DE95627981	
IAEA-ITEREDA/DS–					
04	20:15455	OSTI; NTIS (US Sales Only); INIS		DE95628141	
IAEA-IWG-NPPCI–					
92/2	20:15507	OSTI; NTIS (US Sales Only); INIS		DE95627978	
93/1	20:15527	OSTI; NTIS (US Sales Only); INIS		DE95627979	
95/1	20:15548	OSTI; NTIS (US Sales Only); INIS		DE95627980	
IAEA-NDS–					
107(rev.9)	20:17411	OSTI; NTIS (US Sales Only); INIS		DE95628876	
138	20:16883	OSTI; NTIS (US Sales Only); INIS		DE95628997	
150(rev.94/9)	20:17412	OSTI; NTIS (US Sales Only); INIS		DE95628877	
156	20:16938	OSTI; NTIS (US Sales Only); INIS		DE95629009	
158	20:16940	OSTI; NTIS (US Sales Only); INIS		DE95629011	
168	20:16884	OSTI; NTIS (US Sales Only); INIS		DE95628986	

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IAEA-SM–					
317	20:17413	OSTI; NTIS (US Sales Only); INIS		DE95628860	
317/1	20:17414	OSTI; NTIS (US Sales Only); INIS		DE95628861	
317/10	20:17417	OSTI; NTIS (US Sales Only); INIS		DE95628862	
317/11	20:17418	OSTI; NTIS (US Sales Only); INIS		DE95628878	
317/12	20:17292	OSTI; NTIS (US Sales Only); INIS		DE95628891	
317/14	20:17419	OSTI; NTIS (US Sales Only); INIS		DE95628863	
317/16	20:17293	OSTI; NTIS (US Sales Only); INIS		DE95628893	
317/17	20:17294	OSTI; NTIS (US Sales Only); INIS		DE95628894	
317/20	20:17295	OSTI; NTIS (US Sales Only); INIS		DE95628895	
317/21	20:17296	OSTI; NTIS (US Sales Only); INIS		DE95628896	
317/23	20:17297	OSTI; NTIS (US Sales Only); INIS		DE95628897	
317/27	20:17298	OSTI; NTIS (US Sales Only); INIS		DE95628898	
317/29	20:17420	OSTI; NTIS (US Sales Only); INIS		DE95628864	
317/33	20:15379	OSTI; NTIS (US Sales Only); INIS		DE95628745	
317/37	20:17421	OSTI; NTIS (US Sales Only); INIS		DE95628865	
317/38	20:17299	OSTI; NTIS (US Sales Only); INIS		DE95628899	
317/4	20:17415	OSTI; NTIS (US Sales Only); INIS		DE95628866	
317/41	20:17300	OSTI; NTIS (US Sales Only); INIS		DE95628900	
317/42	20:17301	OSTI; NTIS (US Sales Only); INIS		DE95628901	
317/44	20:17422	OSTI; NTIS (US Sales Only); INIS		DE95628867	
317/45	20:17423	OSTI; NTIS (US Sales Only); INIS		DE95628868	
317/47	20:17424	OSTI; NTIS (US Sales Only); INIS		DE95628869	
317/53	20:17425	OSTI; NTIS (US Sales Only); INIS		DE95628870	
317/55	20:17426	OSTI; NTIS (US Sales Only); INIS		DE95628871	
317/56	20:17427	OSTI; NTIS (US Sales Only); INIS		DE95628872	
317/57	20:17428	OSTI; NTIS (US Sales Only); INIS		DE95628880	
317/58	20:17429	OSTI; NTIS (US Sales Only); INIS		DE95628881	
317/59	20:17302	OSTI; NTIS (US Sales Only); INIS		DE95628902	
317/60	20:17303	OSTI; NTIS (US Sales Only); INIS		DE95628903	
317/62	20:17304	OSTI; NTIS (US Sales Only); INIS		DE95628904	
317/63	20:17430	OSTI; NTIS (US Sales Only); INIS		DE95628873	
317/66	20:17305	OSTI; NTIS (US Sales Only); INIS		DE95628905	
317/7	20:17416	OSTI; NTIS (US Sales Only); INIS		DE95628874	
317/70	20:17306	OSTI; NTIS (US Sales Only); INIS		DE95628906	
317/71	20:17307	OSTI; NTIS (US Sales Only); INIS		DE95628907	
317/75	20:17308	OSTI; NTIS (US Sales Only); INIS		DE95628908	
317/76	20:17431	OSTI; NTIS (US Sales Only); INIS		DE95628875	
IAEA-TECDOC–					
775	20:14990	OSTI; NTIS (US Sales Only); INIS		DE95627044	
776	20:14991	OSTI; NTIS (US Sales Only); INIS		DE95627045	
784	20:15427	OSTI; NTIS (US Sales Only); INIS		DE95628012	
786	20:14921	OSTI; NTIS (US Sales Only); INIS		DE95626768	
787	20:14766	OSTI; NTIS (US Sales Only); INIS		DE95627817	
788	20:15316	OSTI; NTIS (US Sales Only); INIS		DE95627729	
789	20:14992	OSTI; NTIS (US Sales Only); INIS		DE95628050	
IAEA-TSRA–					
2	20:14933	OSTI; NTIS (US Sales Only); INIS		DE95626769	
IBAMD–					
48	20:16942	OSTI; NTIS (US Sales Only); INIS		DE95627357	
IC–					
94/226	20:16811	OSTI; NTIS (US Sales Only); INIS		DE95628225	
94/234	20:16603	OSTI; NTIS (US Sales Only); INIS		DE95627538	
94/308	20:16668	OSTI; NTIS (US Sales Only); INIS		DE95627782	
94/309	20:16669	OSTI; NTIS (US Sales Only); INIS		DE95627783	
94/390	20:16785	OSTI; NTIS (US Sales Only); INIS		DE95628187	
94/392	20:16786	OSTI; NTIS (US Sales Only); INIS		DE95628933	
94/393	20:16738	OSTI; NTIS (US Sales Only); INIS		DE95628161	
94/60	20:16784	OSTI; NTIS (US Sales Only); INIS		DE95628208	
95/24	20:16787	OSTI; NTIS (US Sales Only); INIS		DE95628932	
95/25	20:16828	OSTI; NTIS (US Sales Only); INIS		DE95628258	
95/28	20:16768	OSTI; NTIS (US Sales Only); INIS		DE95628183	
95/29	20:16812	OSTI; NTIS (US Sales Only); INIS		DE95628214	
95/30	20:16943	OSTI; NTIS (US Sales Only); INIS		DE95628309	
95/31	20:17168	OSTI; NTIS (US Sales Only); INIS		DE95628408	
95/32	20:16769	OSTI; NTIS (US Sales Only); INIS		DE95628184	
95/33	20:16951	OSTI; NTIS (US Sales Only); INIS		DE95628313	
95/35	20:16541	OSTI; NTIS (US Sales Only); INIS		DE95627758	
95/36	20:16739	OSTI; NTIS (US Sales Only); INIS		DE95628162	
95/37	20:16740	OSTI; NTIS (US Sales Only); INIS		DE95628915	
95/40	20:17023	OSTI; NTIS (US Sales Only); INIS		DE95629161	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95/41	20:16788	OSTI; NTIS (US Sales Only); INIS		DE95628934	
95/42	20:16959	OSTI; NTIS (US Sales Only); INIS		DE95628436	
95/44	20:16741	OSTI; NTIS (US Sales Only); INIS		DE95628917	
IEA–					
2143/6	20:15841	OSTI; NTIS; INIS		DE95628608	
IEA-SHCP–					
9E-1	20:15310	*See* DTU-LV-MEDD–274			
IEE-SR–					
243	20:15769	OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan		DE95769734	
253	20:15689	OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan		DE95764070	
256	20:15753	OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan		DE95764071	
257	20:15653	OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan		DE95764072	
258	20:14851	OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan		DE95769735	
259	20:15770	OSTI; NTIS; Available from The Institute of Energy Economics, Dai 10 Mori Biru, 18-1, Toranomon 1-chome, Minato-ku, Tokyo, Japan		DE95764073	
IFSR–					
691	20:17147	*See* DOE/ET/53088–691			
694	20:17148	*See* DOE/ET/53088–694			
697	20:17149	*See* DOE/ET/53088–697			
698	20:16764	*See* DOE/ET/53088–698			
IFVE-OEA–					
93-114	20:16401	OSTI; NTIS (US Sales Only); INIS		DE95628785	
93-136	20:17345	OSTI; NTIS (US Sales Only); INIS		DE95628812	
93-145	20:16329	OSTI; NTIS (US Sales Only); INIS		DE95628813	
IFVE-OEF–					
93-138	20:16844	OSTI; NTIS (US Sales Only); INIS		DE95628970	
IFVE-OEIUNK–					
93-115	20:16402	OSTI; NTIS (US Sales Only); INIS		DE95628786	
IFVE-OEIUNK/OEA–					
93-118	20:17346	OSTI; NTIS (US Sales Only); INIS		DE95628814	
IFVE-OKU–					
93-132	20:16378	OSTI; NTIS (US Sales Only); INIS		DE95628723	
IFVE-ONF–					
93-122	20:16403	OSTI; NTIS (US Sales Only); INIS		DE95628787	
93-128	20:16404	OSTI; NTIS (US Sales Only); INIS		DE95628788	
93-95	20:16437	OSTI; NTIS (US Sales Only); INIS		DE95628819	
IHEP–					
93-111	20:16829	OSTI; NTIS (US Sales Only); INIS		DE95628962	
93-126	20:16789	OSTI; NTIS (US Sales Only); INIS		DE95628935	
93-129	20:16405	OSTI; NTIS (US Sales Only); INIS		DE95628800	
93-130	20:17347	OSTI; NTIS (US Sales Only); INIS		DE95628886	
93-153	20:16406	OSTI; NTIS (US Sales Only); INIS		DE95628789	
93-98	20:16845	OSTI; NTIS (US Sales Only); INIS		DE95628971	
IMFUFA–					
291	20:15654	OSTI; NTIS		DE95766518	
INDC(CCP)–					
382	20:16885	OSTI; NTIS (US Sales Only); INIS		DE95628998	
INDC(NDS)–					
316	20:17244	OSTI; NTIS (US Sales Only); INIS		DE95629145	
318	20:17245	OSTI; NTIS (US Sales Only); INIS		DE95629146	
319	20:17246	OSTI; NTIS (US Sales Only); INIS		DE95629147	
320	20:17432	OSTI; NTIS (US Sales Only); INIS		DE95628879	
323	20:16886	OSTI; NTIS (US Sales Only); INIS		DE95628987	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
INDC(USA)–					
106	20:16887	OSTI; NTIS (US Sales Only); INIS		DE95628988	
INEL–					
94/00023	20:15771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008612	MF-528
94/0003	20:16407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008621	MF-2000
94/0005-Rev.1	20:15177	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008618	MF-2020
94/00051	20:16248	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008617	MF-2020
94/00052	20:14993	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008616	MF-2020
94/00134	20:15772	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008608	MF-406
94/0074	20:17348	OSTI; NTIS; INIS		TI95008578	
94/0121	20:17349	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008692	
95/0002	20:17247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008872	PC-400
95/0045	20:15405	*See* NUREG/CR–6260			
95/0048	20:15231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008663	MF-527
INIS-BR–					
3478	20:16496	OSTI; NTIS (US Sales Only); INIS		DE95626550	
3481	20:16610	OSTI; NTIS (US Sales Only); INIS		DE95626721	
3482	20:16542	OSTI; NTIS (US Sales Only); INIS		DE95626503	
3483	20:16543	OSTI; NTIS (US Sales Only); INIS		DE95626519	
3484	20:16199	OSTI; NTIS (US Sales Only); INIS		DE95626351	
3485	20:16544	OSTI; NTIS (US Sales Only); INIS		DE95626504	
3486	20:16616	OSTI; NTIS (US Sales Only); INIS		DE95626530	
3487	20:16545	OSTI; NTIS (US Sales Only); INIS		DE95626520	
3488	20:15600	OSTI; NTIS (US Sales Only); INIS		DE95627093	
3490	20:15683	OSTI; NTIS (US Sales Only); INIS		DE95627061	
3491	20:16408	OSTI; NTIS (US Sales Only); INIS		DE95627022	
3492	20:16131	OSTI; NTIS (US Sales Only); INIS		DE95627515	
3493	20:16132	OSTI; NTIS (US Sales Only); INIS		DE95627516	
3494	20:16133	OSTI; NTIS (US Sales Only); INIS		DE95627517	
3496	20:16134	OSTI; NTIS (US Sales Only); INIS		DE95627518	
3497	20:16135	OSTI; NTIS (US Sales Only); INIS		DE95627519	
3498	20:16136	OSTI; NTIS (US Sales Only); INIS		DE95627520	
3500	20:16137	OSTI; NTIS (US Sales Only); INIS		DE95627521	
3501	20:16138	OSTI; NTIS (US Sales Only); INIS		DE95627522	
3502	20:15918	OSTI; NTIS (US Sales Only); INIS		DE95627670	
INIS-JP–					
031	20:15380	OSTI; NTIS; INIS		DE95768238	
034	20:16974	OSTI; NTIS; INIS		DE95768239	
036	20:16853	OSTI; NTIS; INIS		DE95768173	
039	20:15447	OSTI; NTIS; INIS		DE95768257	
040	20:17170	OSTI; NTIS; INIS		DE95768258	
INIS-mf–					
14184	20:15601	OSTI; NTIS (US Sales Only); INIS		DE95006003	
14480	20:17251	OSTI; NTIS (US Sales Only); INIS		DE95628425	
14481	20:17252	OSTI; NTIS (US Sales Only); INIS		DE95628426	
14482	20:17253	OSTI; NTIS (US Sales Only); INIS		DE95628427	
14483	20:17312	OSTI; NTIS (US Sales Only); INIS		DE95626244	
14484	20:16617	OSTI; NTIS (US Sales Only); INIS		DE95627815	
14485	20:16618	OSTI; NTIS (US Sales Only); INIS		DE95627811	
14486	20:15621	OSTI; NTIS (US Sales Only); INIS		DE95627083	
14487	20:15284	OSTI; NTIS (US Sales Only); INIS		DE95627080	
14488	20:14903	OSTI; NTIS (US Sales Only); INIS		DE95627076	
14489	20:16497	OSTI; NTIS (US Sales Only); INIS		DE95626675	
14490	20:15622	OSTI; NTIS (US Sales Only); INIS		DE95627084	
14491	20:15717	OSTI; NTIS (US Sales Only); INIS		DE95626681	
14492	20:14793	OSTI; NTIS (US Sales Only); INIS		DE95627070	
14493	20:14794	OSTI; NTIS (US Sales Only); INIS		DE95627071	
14494	20:15623	OSTI; NTIS (US Sales Only); INIS		DE95627085	
14495	20:15624	OSTI; NTIS (US Sales Only); INIS		DE95627086	
14496	20:15279	OSTI; NTIS (US Sales Only); INIS		DE95627079	
14497	20:15625	OSTI; NTIS (US Sales Only); INIS		DE95627087	
14498	20:15626	OSTI; NTIS (US Sales Only); INIS		DE95627088	
14499	20:15627	OSTI; NTIS (US Sales Only); INIS		DE95627089	
14500	20:14904	OSTI; NTIS (US Sales Only); INIS		DE95627077	
14501	20:15699	OSTI; NTIS (US Sales Only); INIS		DE95627066	
14502	20:15628	OSTI; NTIS (US Sales Only); INIS		DE95627090	
14503	20:17254	OSTI; NTIS (US Sales Only); INIS		DE95627420	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
14504	20:17433	OSTI; NTIS (US Sales Only); INIS		DE95628142	
14505	20:17434	OSTI; NTIS (US Sales Only); INIS		DE95628143	
14506	20:16859	OSTI; NTIS (US Sales Only); INIS		DE95628267	
14507	20:15258	OSTI; NTIS (US Sales Only); INIS		DE95628116	
14508	20:15215	OSTI; NTIS (US Sales Only); INIS		DE95628139	
14509	20:15329	OSTI; NTIS (US Sales Only); INIS		DE95628112	
14510	20:15330	OSTI; NTIS (US Sales Only); INIS		DE95628113	
14511	20:16670	OSTI; NTIS (US Sales Only); INIS		DE95627790	
14515	20:16191	OSTI; NTIS (US Sales Only); INIS		DE95627539	
14518	20:16926	OSTI; NTIS (US Sales Only); INIS		DE95628304	
14519	20:17350	OSTI; NTIS (US Sales Only); INIS		DE95628148	
14520	20:16411	OSTI; NTIS (US Sales Only); INIS		DE95628032	
14521	20:16671	OSTI; NTIS; INIS		DE95627829	
14523	20:16584	OSTI; NTIS (US Sales Only); INIS		DE95627765	
14524	20:16546	OSTI; NTIS (US Sales Only); INIS		DE95627722	
14525	20:16547	OSTI; NTIS (US Sales Only); INIS		DE95627723	
14526	20:16672	OSTI; NTIS (US Sales Only); INIS		DE95627830	
14527	20:16548	OSTI; NTIS (US Sales Only); INIS		DE95627724	
14528	20:16148	OSTI; NTIS (US Sales Only); INIS		DE95627523	
14529	20:16854	OSTI; NTIS (US Sales Only); INIS		DE95627524	
14530	20:16855	OSTI; NTIS (US Sales Only); INIS		DE95627525	
15109	20:16200	OSTI; NTIS (US Sales Only); INIS		DE95769153	
INP–					
1603/PH	20:16862	OSTI; NTIS; INIS		DE95628974	
1604/PH	20:16832	OSTI; NTIS; INIS		DE95628968	
1606/PH	20:16863	OSTI; NTIS; INIS		DE95628975	
1641/PH	20:16864	OSTI; NTIS; INIS		DE95628976	
1646/PH	20:16833	OSTI; NTIS; INIS		DE95628961	
1651/AP	20:16929	OSTI; NTIS; INIS		DE95629005	
1660/AP	20:16759	OSTI; NTIS; INIS		DE95628927	
1666/PH	20:16813	OSTI; NTIS; INIS		DE95628957	
1667/PH	20:16814	OSTI; NTIS; INIS		DE95628954	
1671/PH	20:16911	OSTI; NTIS; INIS		DE95628994	
1672/AP	20:16347	OSTI; NTIS; INIS		DE95628722	
1675/PH	20:16834	OSTI; NTIS; INIS		DE95628966	
1676/AP	20:16380	OSTI; NTIS; INIS		DE95628724	
INS–					
1087	20:16790	OSTI; NTIS; INIS		DE95767950	
1088	20:16415	OSTI; NTIS; INIS		DE95767951	
INS-J–					
178	20:16849	OSTI; NTIS; INIS		DE95768194	
IS–					
5109	20:17353	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010245	MF-405
5111	20:14994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010235	MF-940
5116	20:16156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010269	MF-2000
IS-M–					
810	20:15726	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010232	MF-404
811	20:15727	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010230	MF-404
812	20:15919	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005904	MF-410; MF-404
813	20:15728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010238	MF-404
814	20:15920	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010237	MF-404
815	20:16085	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010236	MF-404
816	20:15921	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010239	MF-404
IS-T–					
1703	20:15845	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010127	MF-404
1716	20:16086	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010234	MF-404
1718	20:15846	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010244	MF-404
1719	20:15922	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010242	MF-404
1729	20:15923	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010243	MF-404
ITER/US–					
95/IV-BL-03	20:17195	*See* ANL/FPP/TM–278			
IVL-B–					
1180	20:16498	OSTI; NTIS		DE95766671	
1183	20:16499	OSTI; NTIS		DE95766672	
IVO-A–					
07/94	20:15390	OSTI; NTIS; INIS		DE95628753	
IYaF–					
93-110	20:16381	OSTI; NTIS (US Sales Only); INIS		DE95628726	

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JAERI-Conf–					
94-006	20:16291	OSTI; NTIS; INIS		DE95767955	
JAERI-Data/Code–					
94-016	20:16677	OSTI; NTIS; INIS		DE95768149	
94-021	20:17354	OSTI; NTIS; INIS		DE95767954	
JAERI-Review–					
94-007	20:16678	OSTI; NTIS; INIS		DE95768158	
94-011	20:17179	OSTI; NTIS; INIS		DE95768202	
JINR–					
18-92-260	20:15218	OSTI; NTIS (US Sales Only); INIS		DE95626738	
9-92-225	20:16382	OSTI; NTIS (US Sales Only); INIS		DE95626797	
9-92-231	20:16356	OSTI; NTIS (US Sales Only); INIS		DE95626778	
JINR-D–					
14-94-269(v.2)	20:16018	OSTI; NTIS (US Sales Only); INIS		DE95627574	
JINR-E–					
1-94-375	20:16416	OSTI; NTIS (US Sales Only); INIS		DE95626966	
1-94-387	20:16850	OSTI; NTIS (US Sales Only); INIS		DE95627233	
1-94-407	20:16930	OSTI; NTIS (US Sales Only); INIS		DE95627337	
1-94-423	20:16952	OSTI; NTIS (US Sales Only); INIS		DE95628314	
1-94-436	20:16417	OSTI; NTIS (US Sales Only); INIS		DE95628037	
10-92-243	20:15591	OSTI; NTIS (US Sales Only); INIS		DE95626906	
11-90-204	20:17356	OSTI; NTIS (US Sales Only); INIS		DE95626776	
11-94-389	20:17367	OSTI; NTIS (US Sales Only); INIS		DE95627099	
11-94-397	20:17368	OSTI; NTIS (US Sales Only); INIS		DE95627095	
13-91-427	20:16420	OSTI; NTIS (US Sales Only); INIS		DE95626967	
13-94-432	20:16421	OSTI; NTIS (US Sales Only); INIS		DE95628038	
14-94-366	20:16109	OSTI; NTIS (US Sales Only); INIS		DE95626492	
14-94-367	20:17021	OSTI; NTIS (US Sales Only); INIS		DE95627460	
14-94-415	20:16991	OSTI; NTIS (US Sales Only); INIS		DE95628442	
14-94-467	20:16992	OSTI; NTIS (US Sales Only); INIS		DE95628443	
15-94-408	20:16870	OSTI; NTIS (US Sales Only); INIS		DE95627287	
15-94-471	20:16422	OSTI; NTIS (US Sales Only); INIS		DE95628033	
2-94-359	20:16742	OSTI; NTIS (US Sales Only); INIS		DE95627119	
2-94-360	20:16835	OSTI; NTIS (US Sales Only); INIS		DE95627223	
2-94-368	20:16815	OSTI; NTIS (US Sales Only); INIS		DE95627203	
2-94-371	20:16816	OSTI; NTIS (US Sales Only); INIS		DE95627204	
2-94-377	20:16791	OSTI; NTIS (US Sales Only); INIS		DE95627183	
2-94-380	20:16869	OSTI; NTIS (US Sales Only); INIS		DE95627288	
2-94-388	20:16792	OSTI; NTIS (US Sales Only); INIS		DE95627147	
2-94-391	20:16836	OSTI; NTIS (US Sales Only); INIS		DE95627224	
2-94-400	20:16817	OSTI; NTIS (US Sales Only); INIS		DE95627187	
2-94-404	20:16851	OSTI; NTIS (US Sales Only); INIS		DE95627231	
2-94-410	20:16793	OSTI; NTIS (US Sales Only); INIS		DE95628188	
2-94-412	20:16912	OSTI; NTIS (US Sales Only); INIS		DE95627329	
2-94-413	20:16818	OSTI; NTIS (US Sales Only); INIS		DE95628226	
2-94-417	20:17355	OSTI; NTIS (US Sales Only); INIS		DE95628146	
2-94-424	20:16913	OSTI; NTIS (US Sales Only); INIS		DE95628274	
2-94-425	20:16743	OSTI; NTIS (US Sales Only); INIS		DE95628163	
2-94-439	20:16744	OSTI; NTIS (US Sales Only); INIS		DE95628164	
2-94-443	20:16794	OSTI; NTIS (US Sales Only); INIS		DE95628209	
2-94-444	20:16795	OSTI; NTIS (US Sales Only); INIS		DE95628189	
2-94-449	20:16796	OSTI; NTIS (US Sales Only); INIS		DE95628210	
2-94-462	20:16797	OSTI; NTIS (US Sales Only); INIS		DE95628190	
3-94-128	20:16348	OSTI; NTIS (US Sales Only); INIS		DE95626739	
3-94-403	20:16865	OSTI; NTIS (US Sales Only); INIS		DE95627249	
3-94-437	20:16158	OSTI; NTIS (US Sales Only); INIS		DE95627526	
3-94-445	20:16419	OSTI; NTIS (US Sales Only); INIS		DE95628042	
4-92-140	20:16954	OSTI; NTIS (US Sales Only); INIS		DE95627374	
4-92-61	20:16953	OSTI; NTIS (US Sales Only); INIS		DE95627375	
4-94-414	20:16955	OSTI; NTIS (US Sales Only); INIS		DE95628315	
4-94-426	20:16745	OSTI; NTIS (US Sales Only); INIS		DE95628165	
5-94-362	20:16770	OSTI; NTIS (US Sales Only); INIS		DE95627135	
6-94-382	20:16837	OSTI; NTIS (US Sales Only); INIS		DE95627206	
7-92-38	20:16914	OSTI; NTIS (US Sales Only); INIS		DE95627307	
7-94-378	20:16915	OSTI; NTIS (US Sales Only); INIS		DE95627308	
7-94-381	20:16916	OSTI; NTIS (US Sales Only); INIS		DE95627301	
9-94-369	20:16385	OSTI; NTIS (US Sales Only); INIS		DE95626789	
9-94-398	20:16386	OSTI; NTIS (US Sales Only); INIS		DE95626786	
JINR-R–					
1-94-376	20:16917	OSTI; NTIS (US Sales Only); INIS		DE95627302	
10-94-374	20:17369	OSTI; NTIS (US Sales Only); INIS		DE95627096	

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10-94-379	20:16262	OSTI; NTIS (US Sales Only); INIS		DE95627029	
10-94-416	20:17370	OSTI; NTIS (US Sales Only); INIS		DE95628149	
10-94-434	20:16424	OSTI; NTIS (US Sales Only); INIS		DE95628034	
11-94-435	20:17371	OSTI; NTIS (US Sales Only); INIS		DE95628147	
13-94-393	20:16852	OSTI; NTIS (US Sales Only); INIS		DE95627236	
13-94-394	20:16425	OSTI; NTIS (US Sales Only); INIS		DE95626943	
14-94-429	20:16993	OSTI; NTIS (US Sales Only); INIS		DE95628444	
14-94-430	20:16994	OSTI; NTIS (US Sales Only); INIS		DE95628445	
14-94-431	20:16995	OSTI; NTIS (US Sales Only); INIS		DE95628446	
2-92-285	20:16362	OSTI; NTIS (US Sales Only); INIS		DE95626777	
2-94-463	20:16808	OSTI; NTIS (US Sales Only); INIS		DE95627140	
2-94-464	20:16840	OSTI; NTIS (US Sales Only); INIS		DE95628238	
2-94-483	20:16819	OSTI; NTIS (US Sales Only); INIS		DE95628227	
3-94-447	20:16423	OSTI; NTIS (US Sales Only); INIS		DE95628043	
3-94-453	20:16159	OSTI; NTIS (US Sales Only); INIS		DE95627527	
4-94-406	20:16820	OSTI; NTIS (US Sales Only); INIS		DE95627199	
4-94-427	20:16918	OSTI; NTIS (US Sales Only); INIS		DE95628276	
4-94-441	20:16752	OSTI; NTIS (US Sales Only); INIS		DE95628166	
4-94-448	20:16753	OSTI; NTIS (US Sales Only); INIS		DE95628167	
4-94-461	20:16754	OSTI; NTIS (US Sales Only); INIS		DE95628168	
6-94-373	20:16160	OSTI; NTIS (US Sales Only); INIS		DE95626245	
9-92-125	20:16919	OSTI; NTIS (US Sales Only); INIS		DE95627294	
9-94-473	20:16363	OSTI; NTIS (US Sales Only); INIS		DE95627937	
Juel–					
2903	20:16709	OSTI; NTIS (US Sales Only)		DE95769214	
K/TCD–					
1057	20:14934	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009569	MF-504
KAPL–					
4798	20:15391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009332	PC-506
KCP–					
613-5532	20:14995	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008949	MF-702
613-5539	20:15784	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008957	MF-706
KFB–					
92-265-742	20:15811	OSTI; NTIS		DE95766687	
KFK–					
5384	20:14996	OSTI; NTIS (US Sales Only); INIS		DE95769845	
5426	20:15602	OSTI; NTIS (US Sales Only); INIS		DE95769844	
KFK-PEF–					
113	20:16710	OSTI; NTIS (US Sales Only)		DE95769244	
KTH-ALF-R–					
94-3	20:17181	OSTI; NTIS; INIS		DE95629063	
95-1	20:17182	OSTI; NTIS; INIS		DE95629064	
95-2	20:17183	OSTI; NTIS; INIS		DE95629065	
KTH-BYT-AR–					
93-1	20:15754	OSTI; NTIS		DE95766697	
KTM/E-B–					
184	20:14997	OSTI; NTIS; INIS		DE95628824	
L–					
18869-1	20:15046	*See* UCRL-ID–116187-94-11			
LA–					
12825-T	20:16043	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009089	MF-704
12895-MS	20:16500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008110	MF-902; MF-903
12903-PR	20:15314	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009525	MF-1241
12908-MS	20:14998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009090	MF-802
12918-MS	20:15208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009023	MF-900
12923-MS	20:14914	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009022	MF-700
12930-C	20:17372	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009523	MF-705
12935-MS	20:15209	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009021	MF-700
LA-SUB–					
95-42	20:14999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009040	MF-704
LA-UR–					
94-2018	20:15000	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014290	MF-940
94-3256	20:17373	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000943	MF-700
94-4088	20:17374	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005261	MF-405
95-1020	20:16921	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009414	MF-414
95-1039	20:15210	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009413	MF-705
95-1057	20:17255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009498	MF-424
95-107	20:16426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006297	MF-2000

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95-1072	20:16474	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009499	MF-700
95-1074	20:16461	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009497	
95-1082	20:16774	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009495	MF-910
95-1089	20:17256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009494	MF-424
95-1092	20:16427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009492	MF-414
95-1096	20:15005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009491	MF-700
95-1097	20:16775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009489	MF-700
95-1104	20:15673	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009490	MF-900
95-1107	20:16462	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009487	MF-741
95-1110	20:17257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009486	MF-700
95-1117	20:17379	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009483	MF-705
95-113	20:15002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006296	MF-721
95-1130	20:15889	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009485	MF-706
95-164	20:15315	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009436	MF-1242
95-175	20:16679	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006331	MF-700
95-176	20:16456	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006330	MF-700
95-187	20:15655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006328	MF-703; MF-721
95-20	20:17375	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009435	MF-705
95-213	20:15003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006293	MF-721
95-38	20:17376	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006344	MF-905
95-423	20:17377	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007874	MF-705
95-47	20:16263	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006346	MF-706
95-619	20:15885	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007855	MF-704
95-624	20:14795	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007856	MF-101
95-626	20:15886	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007857	
95-631	20:16353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007859	MF-700
95-640	20:16714	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007860	MF-403
95-654	20:16112	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007862	MF-1425
95-728	20:16956	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007850	MF-700
95-784	20:15887	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007844	MF-704
95-790	20:16946	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007838	MF-411
95-795	20:16192	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009437	MF-700
95-817	20:15004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007840	MF-414
95-834	20:16920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009434	MF-413
95-841	20:16460	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009433	MF-706
95-883	20:17378	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009429	MF-700
95-90	20:15001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006334	MF-2020
95-918	20:15888	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009426	MF-704
95-951	20:15592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009421	MF-714
95-966	20:16161	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009417	MF-1414
95-967	20:17118	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009418	MF-1395
95-972	20:16044	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009419	MF-1390
LAMP–					
95/2	20:16773	OSTI; NTIS (US Sales Only); INIS		DE95628929	
LBL–					
36333	20:16602	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008497	MF-408
36500	20:16354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009373	MF-411
LBL-PUB–					
5254(1994)	20:15006	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006594	MF-402
754	20:16264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008449	MF-406
755	20:16265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008450	MF-406
758	20:15755	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008445	MF-1600
LNS–					
176	20:16996	OSTI; NTIS; INIS		DE95628447	
LRAP–					
167	20:16939	OSTI; NTIS; INIS		DE95627345	
LUNBDS-NBKE–					
95-1007	20:16585	OSTI; NTIS		DE95766669	
LUNKDL-NKVK–					
95-1005	20:15290	OSTI; NTIS		DE95766673	
LUTMDN-TMVK–					
3169	20:16252	OSTI; NTIS		DE95766675	
3170	20:15261	OSTI; NTIS; INIS		DE95766670	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
MMS–					
94-0060	20:14852	OSTI; INIS; Minerals Management Service, Technical Communications Service, 381 Elden Street, MS 4530, Herndon, Virginia 22070-4817 (United States)		TI95007123	
MPI-PhE–					
94-34	20:16428	OSTI; NTIS (US Sales Only); INIS		DE95768934	
95-03	20:16429	OSTI; NTIS (US Sales Only); INIS		DE95768483	
MTCI–					
10050-07	20:14776	*See* DOE/PC/90155–T7			
10050-08	20:14777	*See* DOE/PC/90155–T8			
10050-09	20:14778	*See* DOE/PC/90155–T9			
10050-10	20:14779	*See* DOE/PC/90155–T10			
10050-11	20:14780	*See* DOE/PC/90155–T11			
10050-12	20:14781	*See* DOE/PC/90155–T12			
10050-14	20:14782	*See* DOE/PC/90155–T14			
10050-15	20:14783	*See* DOE/PC/90155–T15			
10050-16	20:14784	*See* DOE/PC/90155–T16			
10050-17	20:14785	*See* DOE/PC/90155–T17			
NAHRES–					
23	20:16162	OSTI; NTIS (US Sales Only); INIS		DE95627528	
NDP–					
047	20:16588	*See* ORNL/CDIAC–75			
NEDO-C–					
9329	20:14796	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769803	
NEDO-GET–					
9306	20:15656	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769807	
9308	20:15657	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769808	
9310-3	20:15674	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769802	
NEDO-NP–					
9321	20:15690	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769800	
9322	20:15300	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769801	
NEDO-P–					
93-57	20:15675	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769804	
9327	20:15285	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769806	
9334	20:15691	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95769805	
NEI-DK–					
1424-Rev.	20:15344	OSTI; NTIS; INIS		DE95766471	
1875	20:14909	OSTI; NTIS		DE95766434	
1876	20:15235	OSTI; NTIS		DE95766507	
1877	20:15345	OSTI; NTIS		DE95766509	
1878	20:15785	OSTI; NTIS		DE95766508	
1879	20:15756	OSTI; NTIS		DE95766438	
1880	20:16501	OSTI; NTIS		DE95766510	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
1881	20:15339	OSTI; NTIS; INIS		DE95766443	
1882	20:15311	OSTI; NTIS		DE95766511	
1883	20:15241	OSTI; NTIS		DE95766513	
1884	20:15242	OSTI; NTIS		DE95766512	
1888	20:16304	OSTI; NTIS		DE95766500	
1889	20:16305	OSTI; NTIS		DE95766503	
1890	20:16306	OSTI; NTIS		DE95766502	
1891	20:16307	OSTI; NTIS		DE95766501	
1892	20:16308	OSTI; NTIS		DE95766504	
1893	20:16309	OSTI; NTIS		DE95766505	
1895	20:15786	OSTI; NTIS		DE95766496	
1896	20:15787	OSTI; NTIS		DE95766497	
1897	20:15788	OSTI; NTIS		DE95766498	
1898	20:15789	OSTI; NTIS		DE95766499	
1899	20:15676	OSTI; NTIS		DE95766489	
1901	20:15216	OSTI; NTIS; INIS		DE95628853	
1902	20:15291	OSTI; NTIS		DE95766487	
1903	20:15790	OSTI; NTIS		DE95766492	
1905	20:15757	OSTI; NTIS		DE95766549	
1906	20:15260	OSTI; NTIS		DE95766486	
1907	20:15791	OSTI; NTIS		DE95766490	
1908	20:15792	OSTI; NTIS		DE95766491	
1909	20:16310	OSTI; NTIS		DE95766495	
1910	20:15658	OSTI; NTIS; INIS		DE95766547	
1911	20:14803	OSTI; NTIS		DE95766537	
1912	20:16715	OSTI; NTIS		DE95766538	
1913	20:16716	OSTI; NTIS		DE95766539	
1914	20:16717	OSTI; NTIS		DE95766540	
1915	20:16718	OSTI; NTIS		DE95766541	
1916	20:16719	OSTI; NTIS		DE95766542	
1917	20:16720	OSTI; NTIS		DE95766543	
1918	20:14804	OSTI; NTIS		DE95766544	
1919	20:14805	OSTI; NTIS		DE95766545	
1920	20:16721	OSTI; NTIS		DE95766546	
1921	20:16722	OSTI; NTIS		DE95766527	
1922	20:14806	OSTI; NTIS		DE95766528	
1923	20:14807	OSTI; NTIS		DE95766529	
1924	20:16723	OSTI; NTIS		DE95766530	
1925	20:16724	OSTI; NTIS		DE95766531	
1926	20:16725	OSTI; NTIS		DE95766532	
1927	20:16726	OSTI; NTIS		DE95766533	
1928	20:16727	OSTI; NTIS		DE95766534	
1929	20:16728	OSTI; NTIS		DE95766535	
1930	20:16729	OSTI; NTIS		DE95766536	
1931	20:16730	OSTI; NTIS		DE95766520	
1932	20:16731	OSTI; NTIS		DE95766521	
1933	20:16732	OSTI; NTIS		DE95766522	
1934	20:16733	OSTI; NTIS		DE95766523	
1935	20:16734	OSTI; NTIS		DE95766524	
1936	20:16735	OSTI; NTIS		DE95766525	
1937	20:16736	OSTI; NTIS		DE95766526	
1938	20:15630	OSTI; NTIS		DE95772355	
1940	20:15758	OSTI; NTIS		DE95772358	
1941	20:15718	OSTI; NTIS; INIS		DE95772345	
1942	20:15259	OSTI; NTIS; INIS		DE95772356	
1943	20:15346	OSTI; NTIS		DE95766548	
1945	20:16586	OSTI; NTIS		DE95772347	
1946	20:16552	OSTI; NTIS		DE95772352	
1947	20:14906	OSTI; NTIS		DE95772354	
1948	20:15253	OSTI; NTIS		DE95772349	
1949	20:15254	OSTI; NTIS		DE95772348	
1952	20:15619	OSTI; NTIS		DE95772350	
1953	20:15255	OSTI; NTIS		DE95772376	
1954	20:16480	OSTI; NTIS		DE95772353	
1955	20:15342	OSTI; NTIS; INIS		DE95772375	
1957	20:15793	OSTI; NTIS		DE95772369	
1958	20:15759	OSTI; NTIS		DE95772346	
1959	20:15712	OSTI; NTIS		DE95772382	
1960	20:15236	OSTI; NTIS		DE95772387	
1961	20:16302	OSTI; NTIS		DE95772386	
1963	20:15641	OSTI; NTIS; INIS		DE95772390	

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1965	20:15719	OSTI; NTIS		DE95772395	
1966	20:15760	OSTI; NTIS		DE95772394	
1967	20:15761	OSTI; NTIS		DE95772396	
1968	20:16502	OSTI; NTIS		DE95772393	
1971	20:15347	OSTI; NTIS		DE95772389	
1973	20:15762	OSTI; NTIS		DE95772370	
1974	20:15801	OSTI; NTIS		DE95772373	
1975	20:15763	OSTI; NTIS		DE95772377	
1976	20:15256	OSTI; NTIS		DE95772378	
1978	20:15243	OSTI; NTIS		DE95772385	
1979	20:15794	OSTI; NTIS		DE95772380	
1981	20:15764	OSTI; NTIS		DE95772384	
633(rev.)	20:15338	OSTI; NTIS; INIS		DE95772360	
NEI-NO–					
494	20:15663	OSTI; NTIS; INIS		DE95766570	
495	20:15664	OSTI; NTIS; INIS		DE95766571	
496	20:15692	OSTI; NTIS		DE95766572	
497	20:15693	OSTI; NTIS		DE95766573	
498	20:15694	OSTI; NTIS		DE95766574	
499	20:14853	OSTI; NTIS; INIS		DE95766575	
500	20:16311	OSTI; NTIS; INIS		DE95766576	
501	20:16312	OSTI; NTIS; INIS		DE95766577	
502	20:15706	OSTI; NTIS		DE95766578	
503	20:16313	OSTI; NTIS		DE95766579	
504	20:14905	OSTI; NTIS; INIS		DE95766580	
505	20:15376	OSTI; NTIS; INIS		DE95766581	
506	20:15377	OSTI; NTIS; INIS		DE95766582	
507	20:14808	OSTI; NTIS		DE95766583	
508	20:14809	OSTI; NTIS		DE95766584	
509	20:14810	OSTI; NTIS		DE95766585	
510	20:14811	OSTI; NTIS		DE95766586	
511	20:14812	OSTI; NTIS		DE95766587	
512	20:14813	OSTI; NTIS		DE95766588	
513	20:14854	OSTI; NTIS; INIS		DE95766589	
514	20:14855	OSTI; NTIS; INIS		DE95766590	
515	20:14856	OSTI; NTIS; INIS		DE95766591	
516	20:14857	OSTI; NTIS; INIS		DE95766592	
517	20:14858	OSTI; NTIS; INIS		DE95766593	
518	20:14814	OSTI; NTIS		DE95766594	
519	20:14859	OSTI; NTIS; INIS		DE95766595	
520	20:16314	OSTI; NTIS		DE95766596	
521	20:16315	OSTI; NTIS		DE95766597	
522	20:14860	OSTI; NTIS; INIS		DE95766598	
523	20:14861	OSTI; NTIS; INIS		DE95766599	
524	20:16316	OSTI; NTIS		DE95766600	
525	20:16317	OSTI; NTIS		DE95766601	
526	20:16318	OSTI; NTIS		DE95766602	
527	20:16319	OSTI; NTIS		DE95766603	
528	20:16320	OSTI; NTIS		DE95766604	
529	20:16321	OSTI; NTIS		DE95766605	
530	20:16322	OSTI; NTIS		DE95766606	
531	20:14862	OSTI; NTIS; INIS		DE95766607	
532	20:14863	OSTI; NTIS; INIS		DE95766608	
533	20:14864	OSTI; NTIS; INIS		DE95766609	
534	20:16323	OSTI; NTIS		DE95766610	
535	20:16324	OSTI; NTIS		DE95766611	
536	20:16325	OSTI; NTIS		DE95766612	
537	20:14836	OSTI; NTIS		DE95766613	
538	20:14837	OSTI; NTIS		DE95766614	
539	20:14838	OSTI; NTIS		DE95766615	
540	20:14839	OSTI; NTIS		DE95766616	
541	20:16442	OSTI; NTIS		DE95766617	
542	20:14840	OSTI; NTIS		DE95766618	
543	20:16443	OSTI; NTIS		DE95766619	
544	20:16326	OSTI; NTIS		DE95766620	
545	20:16327	OSTI; NTIS		DE95766621	
546	20:16328	OSTI; NTIS		DE95766622	
547	20:16266	OSTI; NTIS		DE95766623	
548	20:16444	OSTI; NTIS		DE95766624	
549	20:15685	OSTI; NTIS		DE95766625	
550	20:16267	OSTI; NTIS		DE95766626	

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551	20:16268	OSTI; NTIS		DE95766627	
552	20:14877	OSTI; NTIS		DE95766628	
553	20:14846	OSTI; NTIS; INIS		DE95766629	
554	20:14847	OSTI; NTIS; INIS		DE95766630	
555	20:14848	OSTI; NTIS		DE95766631	
556	20:14849	OSTI; NTIS		DE95766632	
557	20:14841	OSTI; NTIS		DE95766633	
558	20:14842	OSTI; NTIS		DE95766634	
559	20:14843	OSTI; NTIS		DE95766635	
560	20:14844	OSTI; NTIS		DE95766636	
NEI-SE–					
196	20:16253	OSTI; NTIS		DE95766676	
197	20:15707	OSTI; NTIS		DE95766705	
198	20:15700	OSTI; NTIS		DE95766696	
NESC–					
1107	20:17342	*See* ESTSC/NRC–000007D113400			
NIFS–					
320	20:17144	OSTI; NTIS; INIS		DE95767949	
NIFS-DATA–					
22	20:17022	OSTI; NTIS; INIS		DE95768190	
NIFS-MEMO–					
14	20:17258	OSTI; NTIS; INIS		DE95768203	
NREL/CP–					
450-4972	20:15233	OSTI; NTIS; GPO Dep.	E 1.99:	DE92010594	MF-1250
NREL/SP–					
420-5570-Rev.2	20:15239	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010302	PC-1503
420-5571-Rev.2	20:15244	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010303	PC-1503
420-5572-Rev.2	20:15813	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010304	PC-1503
420-6365	20:16506	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006864	PC-1503
420-6379	20:15245	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006866	PC-1503
NREL/TP–					
411-7497	20:15292	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004065	MF-1280
411-7498	20:15293	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004066	MF-1280
411-7682	20:15294	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004067	MF-1280
411-7695	20:15295	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004088	MF-1260
412-7680	20:15296	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004063	MF-1250
413-7684	20:15297	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004068	MF-1263
413-7702	20:15298	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004089	MF-1263
441-7805	20:15348	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004061	MF-1211
441-7807	20:15613	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004062	MF-1211
472-7851	20:15301	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004056	MF-1600
473-7575	20:16193	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004058	MF-1414
NRRI–					
92-17	20:15665	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008740	MF-902
NUREG–					
0020-Vol.19	20:15381	OSTI; NTIS; GPO; INIS		TI95010258	
0430-Vol.14	20:15211	OSTI; NTIS; GPO; INIS		TI95009665	
0540-Vol.17-No.2	20:15456	OSTI; NTIS; GPO; INIS		TI95010583	
1514	20:15603	OSTI; NTIS; GPO; INIS		TI95009654	
1517	20:15403	OSTI; NTIS; GPO; INIS		TI95010462	
1525	20:15457	OSTI; NTIS; GPO; INIS		TI95010586	
NUREG/CR–					
4667-Vol.18	20:15384	OSTI; NTIS; INIS; GPO		TI95009017	
4918-Vol.8	20:15007	OSTI; NTIS; GPO; INIS		TI95010562	

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NUREG/CR–					
5591-Vol.4-No.2	20:15404	OSTI; NTIS; GPO; INIS		TI95009673	
5625	20:14935	OSTI; NTIS; INIS		TI95011701	
6046	20:15571	OSTI; NTIS; GPO; INIS		TI95010187	
6192	20:15604	OSTI; NTIS; GPO; INIS		TI95009655	
6220	20:15605	OSTI; NTIS; INIS; GPO		TI95009316	
6235	20:15606	OSTI; NTIS; GPO; INIS		TI95010506	
6260	20:15405	OSTI; NTIS; INIS; GPO		TI95009088	
6266	20:15406	OSTI; NTIS; GPO; INIS		TI95009923	
6283	20:15008	OSTI; NTIS; GPO; INIS		TI95010560	
6300	20:15607	OSTI; NTIS; GPO; INIS		TI95010503	
6316-Vol.1	20:15572	OSTI; NTIS; GPO; INIS		TI95010250	
6316-Vol.2	20:15573	OSTI; NTIS; GPO; INIS		TI95010249	
6316-Vol.3	20:15574	OSTI; NTIS; GPO; INIS		TI95010248	
6316-Vol.4	20:15575	OSTI; NTIS; GPO; INIS		TI95010247	
6316-Vol.5	20:15576	OSTI; NTIS; GPO; INIS		TI95010255	
6316-Vol.6	20:15577	OSTI; NTIS; GPO; INIS		TI95010254	
6316-Vol.7	20:15578	OSTI; NTIS; GPO; INIS		TI95010256	
6316-Vol.8	20:15579	OSTI; NTIS; GPO; INIS		TI95010257	
NYSERDA–					
95-4	20:15246	OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223 (United States)		TI95008744	
95-5	20:15257	OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223 (United States)		TI95008745	
95-6	20:15278	OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223 (United States)		TI95008746	
OCDO–					
95010443	20:14763	OSTI; Ohio Coal Development Office, 77 S. High Street, P.O. Box 1001, Columbus, OH 43266-001 (United States)		TI95010443	
OEFZS–					
4722	20:16201	OSTI; NTIS (US Sales Only); INIS		DE95627557	
4723	20:16202	OSTI; NTIS (US Sales Only); INIS		DE95627558	
4724	20:16203	OSTI; NTIS (US Sales Only); INIS		DE95627559	
ORNL–					
6698	20:14935	*See* NUREG/CR–5625			
6791	20:15604	*See* NUREG/CR–6192			
6830	20:16694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009924	PC-607
6842	20:15677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010498	PC-410
6844	20:15178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008965	MF-2050
ORNL/CDIAC–					
75	20:16588	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009659	MF-402
ORNL/CON–					
405	20:15695	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009064	MF-1322
ORNL/ER–					
193-D2	20:14972	*See* DOE/OR–03-1195-D2			
280	20:15009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009999	MF-2050
290	20:15010	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010053	MF-2070
ORNL/FMP–					
95/2	20:15815	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009200	MF-114
ORNL/M–					
3754	20:15701	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008105	MF-602; MF-603
4156	20:17313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009041	MF-2000
ORNL/Sub–					
91-SK078/1	20:15765	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009937	MF-1600
ORNL/TM–					
11568/V4-N2	20:15404	*See* NUREG/CR–5591-Vol.4-No.2			
12619	20:15614	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009656	MF-900
12782	20:15159	*See* Y/TS–1272			
12788	20:15479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008646	MF-413
12799	20:15773	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008693	
12820	20:17380	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008099	MF-405

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
12867	20:14912	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009185	MF-405
12900	20:15011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009063	MF-2020
12908	20:15012	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009657	MF-2020
12910	20:15013	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009926	MF-2070
12911	20:15179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009183	MF-721
OSU-NE–					
9409	20:16288	*See* DOE/ER/13034–2			
PA-TR–					
3114	20:16204	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009506	MF-504
PATENTS-US–					
A8022579	20:16173	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009973	MF-706; MF-702
A8026643	20:16045	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009975	MF-704
A8026797	20:16445	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009976	MF-706
A8027063	20:16760	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009977	MF-414; MF-406
A8032936	20:16269	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009980	MF-721
A8033473	20:16270	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009981	MF-506
A8033480	20:16194	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009982	MF-107
A8035837	20:17381	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009983	MF-705
A8036581	20:16451	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009984	MF-706
A8037873	20:16463	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009985	MF-701
A8038320	20:16430	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009987	MF-706
A8039668	20:15014	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009989	MF-702; MF-706
A8039677	20:16330	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95009993	MF-706
PITHA–					
94-51	20:16428	*See* MPI-PhE–94-34			
PNC-TN–					
7510-94-006	20:14910	OSTI; NTIS; INIS		DE95768240	
PNL–					
10422	20:15180	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008896	MF-2070
10478	20:16331	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009103	MF-1600
10483	20:16553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010548	MF-2010
10484	20:15146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010407	MF-2010
10485	20:16554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010204	MF-2020
10497	20:15015	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010324	MF-510
10503	20:15016	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009570	MF-2030
10508	20:15017	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010323	MF-2010
10512	20:15018	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010325	MF-2030
10513	20:15247	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010205	MF-1414
10519-1	20:15678	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010547	MF-400
9344	20:15795	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007807	MF-900
9803-Rev.1	20:14979	*See* DOE/RL–94-55-Rev.1			
PNL-SA–					
24262	20:17314	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007814	MF-400
24388	20:16296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007816	MF-2020
24451	20:15019	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007810	MF-2010
24495	20:14743	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007815	MF-401
24505	20:16589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007812	MF-2010
24529	20:16947	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008938	MF-600
24663	20:16555	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009571	MF-701
24897	20:17382	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007806	MF-405
24936	20:15020	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009121	MF-2010
25063	20:15181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008958	MF-702

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
25138	20:15696	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007817	MF-900
25327	20:17315	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009119	MF-400
25481	20:16475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007811	MF-900
25506	20:15890	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008940	MF-404
25590	20:15021	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008935	MF-2000
25648	20:17259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008939	MF-423
25649	20:15022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008936	MF-2030
25858	20:16619	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009120	MF-1400
25864	20:15182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008937	MF-2000
26013	20:15891	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009572	MF-404
PNRI-C(AG)–					
94008	20:16695	OSTI; NTIS (US Sales Only); INIS		DE95628668	
PNRI-C(HP)–					
93002	20:16696	OSTI; NTIS (US Sales Only); INIS		DE95628690	
94007	20:16697	OSTI; NTIS (US Sales Only); INIS		DE95628691	
PNRI-F(SI)–					
91001	20:15217	OSTI; NTIS (US Sales Only); INIS		DE95627091	
POEF–					
3050	20:15145	*See* ES/ESH–50			
PPPL–					
3063	20:17184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008711	PC-420; PC-426
3091	20:17185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009852	PC-427
3092	20:17186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009851	PC-420; PC-427
3093	20:17187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009854	PC-427
3094	20:17188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009853	PC-427
PPPL-CFP–					
3205	20:17260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009625	MF-424
3206	20:17261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009624	MF-424
3231	20:17262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009626	MF-420
PRRC–					
95-9	20:14830	*See* DOE/BC/14977–3			
PTB-E–					
51	20:16431	OSTI; NTIS (US Sales Only); INIS		DE95768503	
PTB-N–					
21	20:16432	OSTI; NTIS (US Sales Only); INIS		DE95768522	
RERF-AR–					
91-92	20:17316	OSTI; NTIS; INIS		DE95768250	
92-93	20:17317	OSTI; NTIS; INIS		DE95768251	
RERF-CR–					
5-92	20:16698	OSTI; NTIS; INIS		DE95768256	
RERF-TR–					
8-92	20:16699	OSTI; NTIS; INIS		DE95768143	
RFP–					
4927	20:15023	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010273	MF-721
4928	20:15024	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010275	MF-721
4935	20:15147	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009113	MF-703
4939	20:15183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009019	MF-602
RISO-R–					
670(EN)	20:15349	OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95766519	
793(EN)	20:17318	OSTI; NTIS; INIS		DE95627114	
797(EN)	20:15350	OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95766441	
800(EN)	20:15679	OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95766440	
804(EN)	20:16205	OSTI; NTIS; INIS		DE95628583	
807(EN)	20:17319	OSTI; NTIS; INIS		DE95628910	
RT/AMB–					
92-17	20:16528	*See* ENEA-RT-AMB–92-17			
92-21	20:16579	*See* ENEA-RT-AMB–92-21			
92-31	20:15221	*See* ENEA-RT-AMB–92-31			
94-26	20:16580	*See* ENEA-RT-AMB–94-26			
95-02	20:17330	*See* ENEA-RT-AMB–95-02			
RT/ERG-FUS–					
93-01	20:17150	*See* ENEA-RT-ERG-FUS–93-01			

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93-12	20:17151	*See* ENEA-RT-ERG-FUS–93-12			
93-35	20:17238	*See* ENEA-RT-ERG-FUS–93-35			
94-01	20:17239	*See* ENEA-RT-ERG-FUS–94-01			
94-08	20:17152	*See* ENEA-RT-ERG-FUS–94-08			
94-10	20:17240	*See* ENEA-RT-ERG-FUS–94-10			
94-11	20:17153	*See* ENEA-RT-ERG-FUS–94-11			
94-12	20:17154	*See* ENEA-RT-ERG-FUS–94-12			
94-15	20:16925	*See* ENEA-RT-ERG-FUS–94-15			
94-16	20:17155	*See* ENEA-RT-ERG-FUS–94-16			
94-19	20:17156	*See* ENEA-RT-ERG-FUS–94-19			
94-20	20:17161	*See* ENEA-RT-ERG-FUS–94-20			
94-22	20:17162	*See* ENEA-RT-ERG-FUS–94-22			
RT/INN–					
94-04	20:15781	*See* ENEA-RT-INN–94-04			
94-20	20:16344	*See* ENEA-RT-INN–94-20			
94-44	20:16614	*See* ENEA-RT-INN–94-44			
94-46	20:15917	*See* ENEA-RT-INN–94-46			
94-47	20:16389	*See* ENEA-RT-INN–94-47			
RUB-E–					
75	20:15602	*See* KFK–5426			
SAIC–					
95-1028-Vol.7	20:15578	*See* NUREG/CR–6316-Vol.7			
95/1028-Vol.1	20:15572	*See* NUREG/CR–6316-Vol.1			
95/1028-Vol.2	20:15573	*See* NUREG/CR–6316-Vol.2			
95/1028-Vol.3	20:15574	*See* NUREG/CR–6316-Vol.3			
95/1028-Vol.4	20:15575	*See* NUREG/CR–6316-Vol.4			
95/1028-Vol.5	20:15576	*See* NUREG/CR–6316-Vol.5			
95/1028-Vol.6	20:15577	*See* NUREG/CR–6316-Vol.6			
95/1028-Vol.8	20:15579	*See* NUREG/CR–6316-Vol.8			
SAND–					
92-1231	20:15385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010401	PC-940
92-2186	20:15025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009315	MF-814
93-3997	20:15026	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008439	MF-814
94-0252C	20:16332	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007746	MF-700
94-0282C	20:17263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008517	MF-712
94-0769	20:15605	*See* NUREG/CR–6220			
94-0785	20:15303	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008524	MF-1301
94-0854	20:15702	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009084	MF-920
94-1026	20:14878	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008798	MF-126
94-1735C	20:16292	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008715	MF-706
94-2134C	20:15027	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004525	MF-2020
94-2135C	20:15028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007732	MF-2070
94-2136C	20:15029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004524	MF-2070
94-2169C	20:16333	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009579	MF-406
94-2205C	20:17383	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004523	MF-706; MF-705
94-2270C	20:16271	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008156	MF-706
94-2294C	20:16470	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006815	MF-705
94-2298C	20:16113	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006306	MF-704
94-2313C	20:15030	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004776	MF-2000
94-2324C	20:16776	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009581	MF-706
94-2343C	20:15031	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008436	MF-2000
94-2373C	20:16457	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009576	MF-706
94-2409C	20:16272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006305	MF-2020
94-2485C	20:16273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008435	MF-2000
94-2514C	20:16471	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006816	MF-706
94-2519C	20:16438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009588	MF-706
94-2525	20:15304	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009085	MF-1301
94-2565C	20:15796	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008437	MF-706
94-2619C	20:16334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004777	MF-704
94-2637C	20:16274	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007735	MF-705
94-2869C	20:16046	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007731	MF-704

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-2891C	20:16472	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007736	MF-700
94-3009	20:15232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009882	MF-713
94-3125	20:17435	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009664	MF-705
94-3129C	20:17384	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009838	MF-706
94-3247C	20:16114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009586	MF-404
94-8235	20:15305	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010338	MF-404
95-0095C	20:16755	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006307	MF-705
95-0116	20:17264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007298	MF-712
95-0138C	20:16700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006899	MF-2000
95-0140C	20:17385	OSTI; NTIS; GPO Dep.	E 1.99:	DE95006821	MF-705
95-0143C	20:14936	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006819	MF-2000
95-0155C	20:16935	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006814	MF-705
95-0273	20:16507	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009083	MF-603
95-0278C	20:16293	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008537	MF-706
95-0284C	20:15892	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007733	MF-704
95-0305C	20:17436	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008545	MF-705
95-0311	20:16464	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008799	MF-705
95-0318C	20:16556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008528	MF-703
95-0322C	20:16047	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008543	MF-701
95-0324C	20:15032	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008819	MF-802
95-0342	20:16478	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009118	MF-700
95-0349C	20:17386	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008503	MF-705
95-0351C	20:16115	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007734	
95-0379C	20:16116	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008434	MF-704
95-0380C	20:15893	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008541	MF-706
95-0389	20:16452	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009082	MF-706
95-0435C	20:15642	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008522	MF-700
95-0437C	20:15033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008530	MF-2000
95-0438C	20:16458	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008544	MF-705
95-0492C	20:17387	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008815	MF-705
95-0495	20:15034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009540	MF-2070
95-0501C	20:17388	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008821	MF-705
95-0561C	20:15608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009590	MF-700
95-0563C	20:15666	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009561	MF-1400
95-0564C	20:15035	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009592	MF-2000
95-0565C	20:15036	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009591	MF-2000
95-0567C	20:16048	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009589	MF-704
95-0568C	20:15037	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009596	MF-2000
95-0570C	20:15667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009584	MF-2020
95-0571C	20:16508	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009580	MF-702
95-0573C	20:16335	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009595	MF-704
95-0574C	20:16557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009585	MF-2020
95-0582C	20:16275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009858	MF-2000
95-0583C	20:16117	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009861	MF-704
95-0584C	20:16558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009594	MF-2010
95-0587C	20:15038	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009593	MF-2000
95-0588C	20:16446	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009583	MF-706
95-0590C	20:17389	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009587	MF-905
95-0609C	20:15797	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009582	MF-704
95-0610C	20:16276	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009842	MF-2060
95-0661C	20:17437	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009868	MF-705
95-0662C	20:16277	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009860	MF-706
95-0664C	20:16118	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009863	MF-704
95-0665C	20:17438	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009862	MF-705
95-0666C	20:17439	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009839	MF-705
95-0670C	20:16447	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009837	MF-700
95-0672C	20:16612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009859	MF-707

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95-0681C	20:16303	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009866	MF-116; MF-126
95-0686C	20:16387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009864	MF-906
95-0721C	20:16448	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009840	MF-706
95-0735C	20:16049	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010453	MF-704
95-8100	20:17390	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010326	MF-405
95-8101	20:17391	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010327	MF-405
95-8102	20:17392	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010328	MF-405
95-8103	20:17393	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010329	MF-405
95-8210	20:16174	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010340	MF-404
95-8211	20:17394	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010341	MF-405
95-8214	20:16278	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010342	MF-706
95-8218	20:17395	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010343	MF-405
95-8220	20:17396	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010661	MF-405
95-8222	20:15807	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010344	MF-1500
95-8456C	20:16254	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004382	MF-700
SBI-MEDD–					
107	20:16119	OSTI; NTIS		DE95772419	
SH-Beretning–					
61	20:16509	OSTI; NTIS		DE95766517	
SIEMENS-KWU-S–					
554/92/011	20:15609	OSTI; NTIS (US Sales Only); INIS		DE95768722	
554/92/013	20:15610	OSTI; NTIS (US Sales Only); INIS		DE95770095	
554/93/002	20:15611	OSTI; NTIS (US Sales Only); INIS		DE95768721	
SINS–					
2146/6	20:16433	OSTI; NTIS; INIS		DE95628790	
2147/2	20:16250	OSTI; NTIS; INIS		DE95628577	
2148/4	20:16439	OSTI; NTIS; INIS		DE95628821	
2149/4	20:16440	OSTI; NTIS; INIS		DE95628822	
2151/1	20:16948	OSTI; NTIS; INIS		DE95629020	
2153/8	20:17397	OSTI; NTIS; INIS		DE95628887	
2154/6	20:16841	OSTI; NTIS; INIS		DE95628963	
SKB-TR–					
94-12	20:15894	OSTI; NTIS; INIS		DE95626416	
94-13	20:15895	OSTI; NTIS; INIS		DE95626417	
94-15	20:16206	OSTI; NTIS; INIS		DE95626352	
94-16	20:15039	OSTI; NTIS; INIS		DE95627051	
94-17	20:16559	OSTI; NTIS; INIS		DE95628653	
94-18	20:16560	OSTI; NTIS; INIS		DE95626532	
94-19	20:15040	OSTI; NTIS; INIS		DE95628830	
94-20	20:15386	OSTI; NTIS; INIS		DE95626856	
94-21	20:17398	OSTI; NTIS; INIS		DE95627100	
94-22	20:17399	OSTI; NTIS; INIS		DE95627101	
94-24	20:16561	OSTI; NTIS; INIS		DE95628654	
94-25	20:16120	OSTI; NTIS; INIS		DE95626491	
94-26	20:15041	OSTI; NTIS; INIS		DE95627052	
94-27	20:15042	OSTI; NTIS; INIS		DE95628831	
94-29	20:15043	OSTI; NTIS; INIS		DE95628832	
94-30	20:15044	OSTI; NTIS; INIS		DE95628833	
SLAC–					
444	20:16781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008628	PC-414
SLAC-PUB–					
95-6755	20:16388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010330	MF-414
SLAC-R–					
95-458	20:16842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010353	PC-414
95-459	20:16843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010099	PC-414
SLAC/AP–					
100	20:16364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009524	MF-414
SNV–					
4223	20:15262	OSTI; NTIS		DE95766690	
4224	20:15263	OSTI; NTIS		DE95766691	
4231	20:16510	OSTI; NTIS; INIS		DE95766689	
4282	20:14867	OSTI; NTIS; INIS		DE95766692	
SP–					
95-08	20:15766	OSTI; NTIS		DE95766688	
SR/OOG–					
94-02/1	20:15708	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95009451	MF-950
94-02/2	20:15709	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95009452	MF-950
STUDSVIK-M–					
94-117	20:15896	OSTI; NTIS; INIS		DE95626429	

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94-141	20:14907	*See* SVF–533			
STUDSVIK-N(H)–					
94-13	20:15480	OSTI; NTIS; INIS		DE95626846	
STUK-A–					
119	20:16511	OSTI; NTIS; INIS		DE95628662	
STUK-B-STO–					
29	20:16701	OSTI; NTIS; INIS		DE95627832	
STUK-B-YTO–					
125	20:15387	OSTI; NTIS; INIS		DE95626857	
STUK-YTO-TR–					
52	20:15580	OSTI; NTIS; INIS		DE95627982	
55	20:14937	OSTI; NTIS; INIS		DE95627933	
74	20:15684	OSTI; NTIS; INIS		DE95627065	
SU–					
4240-604.	20:16787	*See* IC–95/24			
SVF–					
529	20:15897	OSTI; NTIS		DE95766637	
530	20:15248	OSTI; NTIS		DE95766638	
531	20:16512	OSTI; NTIS		DE95766639	
532	20:15703	OSTI; NTIS		DE95766640	
533	20:14907	OSTI; NTIS		DE95766641	
535	20:15372	OSTI; NTIS		DE95766642	
536	20:15373	OSTI; NTIS		DE95766643	
537	20:16590	OSTI; NTIS		DE95766644	
SWE-SWB–					
95-0004	20:15045	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060100	MF-2020
TOHOKU-HEP–					
95-02	20:16843	*See* SLAC-R–95-459			
TOHOKU-HEP-NOTE–					
95-0	20:16843	*See* SLAC-R–95-459			
TUM-HEP–					
215/95	20:16812	*See* IC–95/29			
TVA/LR/NRM–					
92/3	20:15249	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008552	
UCRL–					
52000-94-12	20:17265	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010261	MF-700
53868-94	20:15680	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010403	PC-706
UCRL-CR–					
114243	20:17400	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009527	MF-705
115743	20:17189	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009528	MF-421
119484	20:16562	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009467	MF-907
UCRL-ID–					
114325	20:16441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010331	MF-900
116187-94-11	20:15046	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009883	MF-712
118139	20:15219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010332	MF-700
118223	20:16777	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009380	MF-900
118274	20:16761	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010207	MF-700
118400	20:16936	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009382	MF-700
118619	20:16459	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009610	MF-905
118720	20:16922	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010414	MF-900
118721	20:16923	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010415	MF-900
118775	20:15774	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010416	MF-906
119045	20:16937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010410	MF-700
119071	20:16279	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010662	MF-700
119321	20:15681	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010208	MF-900
119423	20:15388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010209	MF-900
119429	20:16473	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010409	MF-900
119432	20:16465	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009459	MF-700
119557	20:16195	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009469	MF-905
119565	20:16513	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009474	MF-902
119696	20:15643	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009460	MF-2000
119706	20:16449	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009468	MF-902
119720	20:15047	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009473	MF-902
119749	20:16514	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009560	
119816	20:15212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010210	MF-900
119958	20:16297	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009475	MF-704
120404	20:16175	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009670	MF-901; MF-902
120471	20:16591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009541	MF-902

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
UCRL-JC–					
110903	20:15184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009877	MF-902
115700	20:16121	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010259	MF-704
115893	20:16280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009465	MF-2000
115974	20:16563	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009471	MF-902
116695	20:17401	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008077	MF-905
116966	20:17266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009666	MF-1395
117141	20:16434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009566	MF-706
117142	20:16435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009567	MF-706
117182	20:16762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010251	MF-700
117560	20:16606	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009463	MF-408
117774	20:16466	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009476	MF-706
118286	20:16176	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008813	MF-700
118297	20:16941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008827	MF-700
118313	20:16467	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009478	MF-706
118317	20:15048	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008830	MF-2070
118357	20:16778	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008828	MF-412
118363	20:16949	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010265	MF-700
118364	20:16950	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010264	MF-421
118375	20:16468	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009562	MF-741
118383	20:16469	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009564	MF-900
118404	20:16515	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009477	MF-705
118405	20:16516	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009574	MF-702
118408	20:16336	OSTI; NTIS; GPO Dep.	E 1.99:	DE95004964	MF-706
118417	20:16122	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009874	MF-403
118444	20:16436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009871	MF-705; MF-707
118635	20:16564	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009876	MF-705; MF-702
118741-Rev.1	20:15049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009844	MF-700
118754	20:16613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009563	MF-900
118760	20:16479	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009878	MF-700
118767	20:16298	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009568	MF-706
118795	20:15185	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009532	MF-2050
118797-Rev.1	20:16281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009529	MF-2050
118798	20:15668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008074	MF-700
118901	20:15050	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009534	MF-702
118902	20:15051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009535	MF-702
119070	20:17267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010561	MF-414
119102	20:16476	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009872	MF-900
119103	20:16477	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009873	MF-900
119115	20:15148	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009472	MF-810
119292	20:16453	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010253	MF-906
119485	20:16255	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009442	MF-705
119529	20:17402	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009573	MF-705
119584	20:17268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009530	MF-420
119681	20:15898	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009531	MF-704
119682	20:15899	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009533	MF-704
119715	20:16711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009480	MF-902
119773	20:17403	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009575	MF-905
119879	20:17404	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009479	MF-705
120076	20:17269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009869	MF-404
120466	20:16592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009044	MF-902
120680	20:15767	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010733	MF-902
UCRL-LR–					
114962	20:16294	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009464	MF-706
117512	20:17270	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009536	MF-712
UFIFT-HEP–					
9416	20:16810	*See* DOE/ER/40272–212			
UR–					
102	20:16702	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009504	MF-500
USGS-OFR–					
94-451	20:15149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009443	MF-814
UTRCN-G–					
23	20:17320	OSTI; NTIS; INIS		DE95768241	

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UVA–					
527437/CS95/101	20:17408	*See* DOE/ER/25063–T14			
527484/MANE93/101	20:15382	*See* DOE/ER/75788–1			
VTT-PUB–					
184	20:16593	OSTI; NTIS; INIS		DE95628661	
VTT-TIED–					
1523	20:16196	OSTI; NTIS; INIS		DE95627540	
1537	20:16565	OSTI; NTIS; INIS		DE95628646	
1550	20:15900	OSTI; NTIS; INIS		DE95628594	
1556	20:16566	OSTI; NTIS; INIS		DE95628647	
VW-FZL–					
9102/V5	20:16177	OSTI; NTIS (US Sales Only)		DE95770136	
WAPD-T–					
3041	20:16178	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009441	MF-501; MF-506
3044	20:16924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009440	MF-505
WHC-EP–					
0741	20:15150	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010068	MF-2070
0848	20:15186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008792	MF-2000; MF-2030
0852	20:15151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010066	MF-2070
WHC-MR–					
0484	20:15052	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008790	MF-602
0489	20:15798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007818	MF-2000
WHC-SA–					
2491	20:14938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007791	MF-2050
2633	20:15612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006629	MF-2000
2675	20:15053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010108	MF-2000
2676	20:15054	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010107	MF-2000
2729	20:15055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007795	MF-2050
2755	20:16567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005984	MF-2050
2804	20:16282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008030	MF-2030
2809	20:16517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010064	MF-2000
WHC-SD-CP-SA–					
028	20:15187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010143	MF-2000
WHC-SD-CP-SAR–					
021-Vol.1	20:14939	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009101	MF-2000
021-Vol.2	20:14940	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009102	MF-2000
WHC-SD-CP-TP–					
083	20:15056	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010091	MF-2030
WHC-SD-EN-AP–					
093	20:16568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010672	MF-2070
184	20:15057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010089	MF-2010
WHC-SD-EN-EE–					
014	20:15058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010074	MF-2000
WHC-SD-EN-QAPP–					
003-Rev.2	20:15059	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010147	MF-2020
WHC-SD-EN-TI–					
283	20:15188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009154	MF-630

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WHC-SD-EN-TP–					
032	20:16569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010673	MF-2070
WHC-SD-EN-WP–					
012	20:16570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010111	MF-2070
WHC-SD-ER3297-TS–					
001-Rev.2	20:15060	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008433	MF-2030
WHC-SD-ETF-PCP–					
001	20:15061	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010061	MF-2000
WHC-SD-GN-PMP–					
20004	20:15669	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008803	MF-2020
30012	20:17440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008835	MF-2020
WHC-SD-GN-QAPP–					
001-Rev.1	20:15189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008466	MF-2000
WHC-SD-GN-TRP–					
30021	20:15062	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009152	MF-600
WHC-SD-GN-UM–					
30008-Rev.1	20:17321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010046	MF-2000
WHC-SD-LEF-CSCM–					
001	20:15063	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008500	MF-2070
WHC-SD-LEF-OTR–					
001	20:15064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008801	MF-2020
WHC-SD-LEF-QAPP–					
002	20:15065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010149	MF-2010
WHC-SD-LEF-TS–					
001-Rev.2	20:15066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007794	MF-2020
WHC-SD-SNF-CSER–					
001-Rev.1	20:14941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010055	MF-510
WHC-SD-SNF-DR–					
001	20:14942	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008805	MF-2070
WHC-SD-SNF-DRP–					
001	20:15067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008035	MF-2050
WHC-SD-SNF-DRR–					
002-Vol.1	20:15593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010134	MF-2000
002-Vol.2	20:15190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010133	MF-2000
WHC-SD-SNF-HC–					
002-Rev.1	20:15191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008472	MF-2070
WHC-SD-SNF-SD–					
002	20:15068	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010097	MF-2050
WHC-SD-SNF-SM–					
002	20:14943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008806	MF-2070
WHC-SD-SNF-TP–					
009-Rev.1	20:15069	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010056	MF-2010
011	20:15070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008471	MF-2070
013	20:15071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010145	MF-2070
WHC-SD-SQA-CSA–					
20390-Rev.1	20:16283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009149	MF-714
20393	20:14944	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008890	MF-714
WHC-SD-TP-ANAL–					
002	20:15594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010144	MF-2000

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WHC-SD-TP-OMM–002	20:16284	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010191	MF-610
WHC-SD-TP-SEP–029	20:15072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010075	MF-2000
WHC-SD-TP-SWD–004	20:14945	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008882	MF-722
WHC-SD-W007H-OTP–001	20:15152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008420	MF-2050
WHC-SD-W026-PLN–006	20:15073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010148	MF-2020
WHC-SD-W026-QAPP–001-Rev.1	20:15074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010105	MF-2000
WHC-SD-W059-FHA–001	20:16285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010577	MF-2050
WHC-SD-W100-TD–001	20:15075	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010088	MF-2020
WHC-SD-W112-CSER–001	20:15076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010103	MF-2020
WHC-SD-W151-ATP–002	20:15077	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010226	MF-2030
WHC-SD-W236A-PLN–006-Rev.2	20:15078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009092	MF-2000
WHC-SD-W236A-SDRD–001-Rev.1	20:15079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005466	MF-2030
WHC-SD-W236A-TR–001-Rev.1	20:15080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010228	MF-2030
WHC-SD-W320-CBA–001	20:15081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010077	MF-2030
WHC-SD-W340-ECOR–001	20:15082	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010079	MF-2060; MF-2030
WHC-SD-WM-ANAL–029	20:15083	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010136	MF-2030
WHC-SD-WM-AP–005-Rev.5	20:15192	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005626	MF-2030
035	20:15084	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010192	MF-2030
WHC-SD-WM-ATP–063-Rev.1	20:15085	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010139	MF-2070
106	20:15086	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005098	MF-2030
124	20:15087	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008881	MF-2070
127	20:15088	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010140	MF-2070
WHC-SD-WM-ATR–094	20:15089	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009095	MF-2030
112	20:15193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008807	MF-2030
WHC-SD-WM-CGA–001	20:15090	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010137	MF-2030

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WHC-SD-WM-CMD–					
001	20:15194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008885	MF-2030
002	20:15091	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008838	MF-2030
003	20:15092	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008834	MF-2030
WHC-SD-WM-CSUD–					
010	20:17441	OSTI; NTIS; GPO Dep.	E 1.99:	DE95008049	MF-905
WHC-SD-WM-DA–					
183	20:15093	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005097	MF-2030
WHC-SD-WM-DP–					
079	20:15094	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005412	MF-2030
098	20:15095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009147	MF-2070
099	20:15096	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010043	MF-2070; MF-2030
101	20:15097	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010193	MF-2070
WHC-SD-WM-EE–					
004-Rev.1	20:15098	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008432	MF-2030
WHC-SD-WM-ER–					
394	20:15099	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010229	MF-2030
417	20:15100	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008884	MF-2070
431	20:15101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010135	MF-2030
WHC-SD-WM-ES–					
333	20:15102	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010142	MF-2030
WHC-SD-WM-ETP–					
058	20:15103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007792	MF-2030
137	20:15104	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009098	MF-2030
146	20:15105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010049	MF-2030
148	20:15106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010058	MF-2030
WHC-SD-WM-HC–					
014	20:15195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010060	MF-2030
WHC-SD-WM-ISB–					
003	20:15107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010041	MF-2020
WHC-SD-WM-OTR–					
148	20:15108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010072	MF-2030
151	20:15109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010141	MF-2030
WHC-SD-WM-PLN–					
091	20:15110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010086	MF-2030
WHC-SD-WM-PROC–					
014	20:15111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010083	MF-2070
018	20:15112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009150	MF-2030
019	20:14946	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009153	MF-2030
WHC-SD-WM-QAPP–					
018-Rev.1	20:15113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010084	MF-2030
WHC-SD-WM-RPT–					
102	20:15114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010087	MF-2030

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WHC-SD-WM-RPT–					
118	20:15115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009156	MF-2000
WHC-SD-WM-SARR–					
034	20:15116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009155	MF-2030
WHC-SD-WM-SDRR–					
001	20:15117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010080	MF-2030
WHC-SD-WM-TA–					
160	20:15118	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009100	MF-2030
161	20:15196	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010063	MF-2000
WHC-SD-WM-TP–					
259-Rev.1	20:15119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008883	MF-2070
289	20:15120	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007793	MF-2070
299	20:15121	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010085	MF-2030
300	20:15122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010071	MF-2070
308	20:15123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008416	MF-2070
309	20:15124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008415	MF-2070
310	20:15125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010138	MF-2070
330	20:15126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010807	MF-2070
WHC-SD-WM-WP–					
132-Rev.5	20:15127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010059	MF-2030
WHC-SP–					
0849	20:15197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008791	MF-2000
1143	20:15128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008029	MF-2030
WSRC-MS–					
94-0463	20:15901	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95005886	MF-706
94-0488	20:15220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060101	MF-706
94-0544	20:16286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95004801	MF-706; MF-714
94-0604	20:15129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060079	MF-2030
94-0605	20:14915	OSTI; NTIS; GPO Dep.	E 1.99:	DE95005887	MF-706
95-0008	20:15477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006473	MF-706
WTD–					
92-046	20:15130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009462	MF-2020
Y–					
2467-3	20:15902	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009061	MF-700
Y/DK–					
1043	20:14902	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002056	MF-701
Y/DV–					
1356	20:16050	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009313	MF-704
1359	20:15903	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009060	MF-704
Y/DW–					
1351	20:15213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009051	MF-713
1352	20:16051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009510	MF-704
Y/DZ–					
1124	20:16571	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009062	MF-701
Y/EN–					
4683	20:16737	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009053	MF-703
5288	20:15153	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009046	MF-702
5289/V1	20:15198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009047	MF-702
5289/V2	20:15154	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009194	MF-702
5289/V3	20:15199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009195	MF-702
5289/V4	20:15131	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009188	MF-702
5289/V5	20:15155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009049	MF-702
5289/V6	20:15156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009048	MF-702

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Y/ER–					
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159/V2	20:15201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009196	MF-702
159/V3/Pt.A	20:15202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009068	MF-702; MF-2050
159/V3/Pt.B	20:15203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009069	MF-702; MF-2050
210	20:15204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009197	MF-702
Y/ER/SUB–					
91-ALV96/6-Rev.2	20:15205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009519	MF-702
Y/SUB–					
28B-99920C/94-2	20:16573	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009052	MF-702
94-99069C(Y13)/1	20:15157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009056	MF-702
94-99069C(Y13)/2	20:15206	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009187	MF-702
94-99069C/Y15/10/R1	20:16574	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009394	MF-702
94-99069C/Y15/11	20:15135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009520	MF-702
94-99069C/Y15/12	20:16575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009039	MF-702
94-EAQ10C/2/P2	20:15136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009199	MF-702
94-EAQ10C/4	20:16576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009065	MF-702
94/EAQ10C/3/P2	20:15158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009066	MF-702
Y/SUB/WM–					
213	20:15137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009186	MF-702
Y/TS–					
1001	20:16577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009405	MF-702
1022	20:15138	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009057	MF-702
1196	20:15644	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009055	MF-700
1263	20:15139	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009059	MF-703
1264	20:16578	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009058	MF-703
1272	20:15159	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010227	PC-714
YJT–					
94-04	20:16594	OSTI; NTIS; INIS		DE95626548	
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VC Saint Vincent and the Grenadines
VE Venezuela
VN Viet Nam
VU Vanuatu

WS Samoa

YE Yemen, Republic of
YU Yugoslavia

ZA South Africa
ZM Zambia
ZR Zaire
ZW Zimbabwe

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ED EANDC [European American Nuclear Data Committee]
EP European Patent Office
IO ILO [International Labor Organization]
IX IUPAC [International Union of Pure and Applied Chemistry]
QS INSPEC [Information Service in Physics, Electrotechnology and Control]
QZ INPADOC [International Patent Document Centre]
WO WIPO [World Intellectual Property Organization]
XA IAEA [International Atomic Energy Agency]
XC CERN [European Organization for Nuclear Research]
XD OECD [Organization for Economic Co-Operation and Development]
XE CEC [Commission of the European Communities]
XF FAO [Food and Agricultural Organization of the United Nations]
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XJ JINR [Joint Institute for Nuclear Research]
XK WMO [World Meteorological Organization]
XN NEA [Nuclear Energy Agency of the OECD]
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